Electrical World

Published by McGraw Publishing Company, Inc.

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.

Vol. 63 NEW YORK, SATURDAY, APRIL 4, 1914 No. 14

Deliberation Before Legislation

Regarding the proposed anti-trust legislation now pending before Congress, to which reference was made in these columns last week, the most important feature of the week has been the receipt at Washington of various expressions to the effect that whatever be done should be done slowly. It is obvious that the body of business opinion in the country is becoming articulate, and it is certainly matter for congratulation that the prevailing sentiment of at least some of the commercial interests is finding expression. It is also gratifying to note that the general tenor of the resolutions which have been handed to the President from such bodies as the New York Chamber of Commerce, the Merchants' Association and the American Manufacturers' Export Association is eminently sane and reasonable, and that these bodies are entering the debate in no spirit of partisanship and passion. In effect, Congress is now being advised that, since the proposed legislation is concerned with the conduct and regulation of business, both big and little, an attentive ear ought to be lent to the voice of business. Protests as to specific proposals may or may not become necessary later. The point for us to note is that at present the business interests are making a reasonable plea for deliberation and mature judgment—a time of deliberation during which the party that is to be regulated may be heard before decision is made concerning the method of regulation.

The New York Commissioners

The Public Service Commission appointments of Governor Glynn of New York are greatly to be regretted. This is not a reflection upon the appointees, who may be estimable incumbents of other offices and of wide usefulness in other spheres of life. It is a criticism of the Governor for his choice of men to fill positions in which there is special need of aptitude for the duties to be performed. The salary of $15,000 a year written into the law for the New York commissioners was not designed as a political plum; it was intended to secure men of adequate experience and ability. If it is not to be used for the original intended purpose, it should be reduced. No reasonable price that the State pays for commissioners of ability equal to the needs of the position is too high if the desired men are obtained. Any price paid is too high if the State gets less than it ought to have. Efforts were made by engineering societies to impress upon Governor Glynn the engineering nature and importance of the problems of the commissions, and there was a general hope that they would result in the recognition of engineers in the appointments. The selection of engineers would have tended to restore the original complexion of the commissions and to produce the harmony which should prevail in their deliberations and is now conspicuous by its absence. The appointments are of as much concern and regret from the corporation standpoint as from the public standpoint. Anything that lessens the efficiency of regulation discredits the whole policy of state regulation. It is the policy of state regulation on which the companies must depend for a fair settlement of their serious problems. If state regulation is a failure, the alternative will be public ownership and operation, with even greater failure.

Minimizing "Moving-Day" Peaks

In many American cities leases are written to expire on April 30 or Sept. 30, so that, by long-established custom, May 1 and Oct. 1 have come to be regarded as "moving day." A large proportion of the population of the cities is transitory, and it follows that a great burden of making changes, disconnections and connections falls on the public utility companies by reason of the moving-day custom. An effort is being made in Chicago under the auspices of the Chicago Real Estate Board to cause renting agents to co-operate with the board in an endeavor to have leases terminate at various times during the year rather than almost entirely on the two dates mentioned. The movement is one that deserves general encouragement in all cities. In Chicago representatives of the electric-service company, the gas company, the telephone company and of the van and warehouse interests have joined with the real-estate men in an effort to bring about the proposed reform, which, by general consent, is believed to be to the advantage of all the business interests concerned as well as of the general public.

Some Impressive Truck Figures

If other than mere technical arguments are needed to present an effective case for the electric truck as the logical means of parcel-post delivery, we believe that a practical business administration cannot fail to be impressed by the hard-cash totals which private industry has seen fit to invest in this form of conveyance. The department stores and express companies, for example, are confronted with the identical delivery problems which are before the parcel-post officials—long runs, numerous stops and small-package deliveries. Proof of the solution which the department stores have

found is the $6,000,000 worth of electric trucks already in their service, and most of this amount, it may be added, represents repeat orders. The express and transfer companies have about $3,000,000 invested in trucks and are among the most enthusiastic in their praise of the practical service of these vehicles. Next to the department stores, curiously enough, comes the brewing industry with over $5,000,000 in battery-driven wagons—substantial evidence of the confidence placed in the electric vehicle by a most conservative class of manufacturers. The public-service companies appropriately use $3,000,000 worth of trucks in their own business, and the various government departments both in this country and its insular possessions already have a half million invested in electric wagons, exclusive of the rented vehicles used in post office haulage and parcel-post delivery. Such figures as the foregoing, which are based on authoritative information, are perhaps even more significant and satisfying to the prospective purchaser than several columns of ton-mile data, for whatever the courage of one's convictions, he cannot but feel more comfortable when in goodly company. Surely a fair start has been made in the putting of $20,000,000 worth of electric trucks in service. The days of the up-hill struggle are over, and the movement already begun may now be expected to gather impetus until the promised "all-electric" truck era has been attained.

The Practical Use of Color Effects

The article by Mr. M. Luckiesh in this issue brings to the front possibilities in the use of colored lighting which heretofore have had scant consideration. One of the first suggestions in this line came from Prof. R. W. Wood, of Baltimore, who pointed out the wonderful results that could be obtained in illuminating paintings by projecting upon them light from a suitably colored stencil. Mr. Luckiesh has gone very much further in this line, showing the admirable effects which may be obtained not only by varying the illumination upon pictures in color and direction, but in producing shifting scenes and flashing signs by the suitable use of colored lights. The possibilities of color in illumination have been appreciated only in very recent times. In fact, it is only with high-efficiency illuminants that selective color absorption becomes economically possible, and with it the production of brilliant color effects in connection with the objects illuminated.

"Artificial daylight" has already been produced in several forms, all useful although not by any means concordant. We have pointed out before that it is quite as necessary to settle upon what shall be considered standard daylight as to be able to furnish it when required. Apart from all this, however, comes the possibility so admirably set out by Mr. Luckiesh of using colored illumination to produce effects which can hardly be duplicated in any other way. Perhaps the first applications of such methods will be in stagecraft, which already depends in so great measure on skilful and artistic lighting. The stage electrician has already grasped the possibilities of colored illumination in itself, but the thing here considered—adaptation of colored illumination to the colors of the things illuminated—opens a still broader field for ingenuity. The coming of the nitrogen-filled tungsten lamp with its excellent intrinsic color and very high efficiency puts in the hands of the illuminating engineer at last a source which can be freely used in these ways, particularly since it is not difficult to manufacture such lamps with concentrated filaments which lend themselves particularly well to projection. It is a most interesting field of investigation which we hope Mr. Luckiesh will continue to till.

Economy in Station Operation

The great improvement in station economy possible by the use of modern apparatus and methods is in no wise better shown than in the brief account of the new station of the Savannah Electric Company in another column. In this instance the replacement of an obsolescent station has shown more than usually excellent results. It is no small thing to have reduced the working staff of a generating plant from fifty-four to twenty-two men all told, including substation attendants, particularly when in the change the automatic stoking of cheap coal has been provided for. In nothing is the new plant more notable than in its improvement of boiler equipment. We have been advocating large boilers in season and out, and the excellent effect of the change made in this instance from units averaging only 260 nominal hp to those of 665 hp emphasizes the lesson in economy. Then, too, the passage from comparatively small reciprocating engines to large turbines showing a low steam consumption is a great gain in itself. The whole design of the new plant tends toward that simplification which is necessary to the production of electrical energy at a low cost.

Roughly, one may say that there are in existence two types of large stations, one that has grown by accretion of units of small size, the other in which the fundamental principle has been realized that the best station design calls for the installation of as few units as give due security in reserve. The first-mentioned type shows practically no better economy than that of a small group of the individual units. The latter makes possible gains which can come only through the added efficiency of and lessened labor with large units. In the earlier stages of electric work dozens of small belted machines furnished the output. That day of complication and high costs has passed, and improvements now take the direction of replacing the older equipment of the succeeding stage in station development with apparatus suitable for the loads and load-factors now encountered. One of the best features of the present situation is the lessened depreciation shown by the more modern equipment. Estimates of depre-

ciation made ten or fifteen years ago must be entirely revised at the present time. While no change can be considered a permanent one, yet each modification brings lessened likelihood of rapid depreciation due to change in the art.

Wet Filtration of Cooling Air

Reference is made in the Digest of this issue to an article by Mr. D. A. Hackett upon a method of wet filtration of cooling air supplied to electrical machinery. It is long since dynamo machines depended entirely upon mere contact of their hot surfaces with the external air to carry off the air-convected heat. In all large rotating machinery the rotors are constructed with channels and ducts in such a manner that the air lying in these passages is urged forward by centrifugal force and rejected from the machine after it has become heated to some extent by contact with the hot walls of the passages. In this way the forced convection of heat from the machine during its operation is greatly increased. It is true that a certain amount of power is consumed mechanically in wind production by such procedure, but this disadvantage is far outweighed by the advantage secured in increased output without exceeding the temperature limit and often with increased efficiency.

The cooler the air which can be introduced into the ducts of the rotor the greater will be the quantity of heat which this air can carry off in its passage through the machine. If the air is merely discharged into the room and recaptured from the same source, the air temperature in the room tends to be raised, unless ample room ventilation is provided.

The process described by Mr. Hackett's article consists in bringing the incoming air which is to be passed through the machine into intimate contact with water in the form of a finely divided spray. This must have three effects. First, it will remove some impurities from the intaken air, either mechanical impurities like dust or chemical impurities such as acid or alkaline fumes. Whether such impurities as ordinarily exist in city intake air are prejudicial to electrical machinery is debatable, but at least it is likely to be admitted that impurities do not do any good, and that their removal by filtration is more likely to be beneficial than otherwise. Second, the intake air is likely to be cooled, because the cooling water is rarely as warm as the intake air. This cooling of the air is likely to increase the cooling effect of the air blast on the machinery, and thus to make the filtration worth while. Third, the water content of the incoming air is sure to be increased, not only in the form of gaseous water-vapor, but also in the form of entrained drops or liquid particles. If baffle plates are used, as suggested in the article, the entrained drops are likely to be discharged, and only the aqueous vapor needs to be considered. That is, the air, after wet filtration, is likely to be humid almost to saturation. As soon as it enters the machine, however, or even before it reaches the machine, the advancing air rises in temperature and falls below saturation, so that with the machinery in regular operation there seems to be little likelihood of moisture being deposited in it. The extra moisture contents will tend slightly to increase the absorption of heat from the machine during its passage. The benefit of this absorption due to aqueous vapor is, however, probably small by comparison with that due to the cooling of the intake air.

There can be no doubt that this water filtration acts in the right direction for further progress, namely, in increasing the effect of forced ventilation. The only question is as to the extent of the gain compared with the effort required to filter the air. It is to be hoped, however, that means may be found to utilize either the latent heat of steam or the thermal capacity of water in the cooling machinery. If water spray could be safely introduced into the passages and then evaporated, the increase in cooling effect would be very marked over that due merely to raising the temperature of the incoming moist air. Of course, such water channels would have to be kept separate from the insulated electric conductors.

Properties of Selenium Blocks

Selenium, as is well known, is a very imperfect electric conductor. It stands on that somewhat disreputable neutral ground which divides non-conductors from conductors. It has been classified with each group by different classifiers at different times. It compensates, however, for its indefiniteness as a conductor by its remarkable property of changing its conducting power under the influence of changes in intensity of incident light. In general, it conducts better in the light than in the dark, a phenomenon accidentally brought to light in attempts to make a simple high-resistance block out of a selenium lump. The action has been shown to be very complicated, both chemically and physically.

In a paper in the February number of the *Philosophical Magazine*, on "The Properties of Selenium Blocks," Mr. G. W. White describes some measurements tending to show that the effect of light on the resistance in selenium is largely developed at the contact surface or surfaces of the electrode. That is, the effect is held to be developed largely at the metal-selenium contact, and to a lesser degree in the substance of the illuminated selenium.

It would seem, at first thought, an easy matter to put such a proposition to experimental test by placing a prism of selenium between a pair of terminal electrodes and exposing only a short length of the prism at a time to incident light, so as to determine the relative change in resistance when the light shines on the middle and on the end of the prism. Yet the experimental difficulties in the test are considerable, if only owing to the high resistivity of the selenium and to the expansion of the prism under incident light.

The News of the Week

Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.

United Gas Improvement Company Under Government Investigation

Attorney-General McReynolds has acted on complaints filed with the Department of Justice against the United Gas Improvement Company of Philadelphia charging it with violations of the Sherman anti-trust law, and the case has been placed in the hands of Assistant Attorney-General Todd. According to President S. T. Bodine of the United Gas Improvement Company, which controls a number of electric properties throughout the country, he had an interview with the Attorney-General some time ago on this subject and at that time offered the Department of Justice every facility to make the investigation thorough and complete. Subsequently a special representative of the Department of Justice visited Philadelphia and every detail of the company's business was submitted to him. The view of the Department of Justice has not yet been learned.

Electrical Development Campaign Prizes Awarded

The Society for Electrical Development has mailed checks in payment of the prizes awarded in the campaign for membership carried on in its behalf by the Jovian Order. The first prize of $500 for the Jovian League securing the greatest number of subscribers was awarded to the Cleveland Jovian League. The first prize of $250 to the individual securing the greatest number of subscriptions was awarded to Mr. J. C. Bartlett, of Philadelphia. The second prize of $150 for the individual securing the next greatest number of subscriptions was awarded to Mr. H. F. Viot, Omaha, Neb. The third prize of $100 for the individual securing the third greatest number of subscribers was divided equally between Mr. W. J. Trott, Fostoria, Ohio, and Mr. C. A. Taylor, Youngstown, Ohio.

Each of these checks was accompanied by a letter from the society expressing its thanks to the prize winners for their co-operation and assistance.

New York Chamber of Commerce Would Postpone Trust Legislation

A special committee appointed by the Chamber of Commerce of New York City has made a report urging that action on trust legislation be deferred to another session of Congress. The committee says that the spirit of the bills is opposed to the utterances of President Wilson on the subject of business legislation. The committee believes that "what business men generally desire, what industry most needs, is the certainty of a period of rest for the peaceful readjustment of all enterprise that is inconsistent with the accepted principles of law and ethics and for the energetic advancement of all individual endeavor free of any sense of repression, secure in a sense of liberty of action, and guarded from the danger that the disclosure of personal prerogatives and private achievements would entail."

Dr. Pupin on the Electromagnetic Theory

Under the auspices of the committee on technical lectures of the American Institute of Electrical Engineers, Dr. Michael I. Pupin, professor of electro-mechanics at Columbia University, New York City, is to deliver two lectures on "The Electromagnetic Theory." The first lecture will be given at the Engineering Societies Building, New York City, Wednesday evening, April 29, and the date of the second will be announced later. Dr. Pupin will treat the subject from the points of view of the physicist and the electrical engineer, and will endeavor to differentiate these points of view.

Bell Telephone Litigation with Government Settled

The combination by which the Bell system dominated the telephone lines of Washington, Oregon and Idaho was dissolved on March 26, when a decree, accepted by the Pacific Telephone & Telegraph Company and conceding the government's demands, was entered in the federal court at Portland, Ore. In a statement the Department of Justice said:

"The decree adjudges that the defendants combined to monopolize the means of telephonic communication in and among the States named in violation of the anti-trust act and forbids them to form any like combination in the future. The Bell companies are ordered to dispose of their holdings in the Northwestern and Interstate companies—the two long-distance companies—and are prohibited from acquiring hereafter any interests in those companies.

"The decree further orders the Bell companies to sell their holdings of the stock and bonds of the Home Company of Spokane, but it is provided that if the city of Spokane within three months shall determine it to be in the interest of the people of that city to consolidate the exchanges of the Home Company and of the Bell companies under the control of the latter, application may be made to the court so to modify the decree as to permit that to be done.

"The decree condemns as unlawful all contracts by which local companies agree to give their long-distance business to the Bell companies exclusively, and prohibits the latter from accepting any benefits thereunder."

Mr. Theodore N. Vail, president of the American Telephone & Telegraph Company, at the annual meeting of the stockholders in New York on March 31 said that never before in the history of the company to the best of his knowledge had the business been so free from vital questions of policy of procedure. There is not a single suit pending against the company in any state or federal court charging any violation in any anti-trust law.

Regarding future financing Mr. Vail said: "Arrangements have been made by some of our associated companies to finance themselves for the immediate future and to repay some of the money advanced to them by this company to such an extent that it is not ex-

pected that it will be necessary for this company to issue stock or any new securities at least before the first half of the year 1916."

Electric Heating of Water Pipes to Prevent Freezing

By keeping currents of several hundred amperes flowing continuously through water pipes which otherwise would have been in danger of freezing, it was possible to continue construction work on the hydro-electric development of the Cedar Rapids Manufacturing Power Company near Cedars, Quebec, without interruption during even the coldest days of the past winter. The 1-in. pipes thus protected supplied water for the steam shovels and were laid above ground, as continuous shifting prevented them from being buried.

Current for the pipe circuits was obtained from a bank of transformers stepping down from 2300 volts to 220 volts and 110 volts. The pipe connections consisted of copper wires wound around the ends of the pipes and buried several feet in the earth to prevent the pipes from freezing back of the connections. When the temperature was below zero, and even as low as — 27 deg. Fahr., it was found that 40 kw at 220 volts would keep 1500 ft. of 1-in. pipe from freezing, even with water standing in it. A 1000-ft. pipe required 20 kw at 110 volts. Energy for construction purposes about the site, as well as for this novel electric-heating application, was furnished by the 10,000-hp water-power plant of the provincial Light & Power Company near by.

On the pipes supplying compressed air to the various drills it was noticed that when the temperature dropped below 5 deg. Fahr. no trouble was experienced from the moisture in the air. For temperatures from 5 deg. to 40 deg. there was difficulty when the air was not reheated. That no reheating was necessary for the lower temperatures is explained by the theory that the air was so cold that the moisture was frozen out of it before entering the machine. The work is carried out under contract by Frazer, Brace & Company, of New York City.

Alabama Power Company and Public Interest

In order to place before the people of Alabama the position in which the Alabama Power Company stands with regard to public interest, the company has distributed a pamphlet relating to its water-power developments. The pamphlet is signed by Mr. James Mitchell, vice-president.

The belief is expressed that no natural resource in Alabama promises so much for the development of the State at this time as does the development of the Coosa, Tallapoosa and Tennessee Rivers proposed by the company. When in 1907 an act of Congress for the construction of a dam at Lock 12 on the Coosa River was approved, the Alabama Power Company was a domestic company with a small capital, and it has maintained its status as a domestic company to this date. The original stockholders, citizens of the State who resided at Gadsden, interested other citizens of the State in the purchase of land at other sites along the Coosa River, and they also organized domestic companies and purchased sites. Jointly and separately the stockholders of the companies then endeavored over a period of years to finance the developments. Local capital was manifestly inadequate. Northern capital fought shy of the project. Governmental aid had been invoked repeatedly. Under such circumstances foreign capital was the only remaining hope, and in 1911 the owners induced Sperling & Company, London, to undertake developments.

Mr. Mitchell emphasizes the points that such development as the company contemplates has for its purpose utilization and not waste of water-power, introduction of new industries, industrial development of the State, conservation of millions of tons of coal annually and improvement of navigation of a region involving several states.

The circular discusses the wisdom of the law exempting from taxation for a period of years the structures and other property of power companies, including their franchises, except the lands which the companies may acquire. Water-power companies have found many difficulties in working out developments in Alabama and other states. Developments are seldom made within original estimates. Unexpected conditions arise which it is not possible to foresee, and as a result the single development of the Alabama Power Company at Lock 12, on the Coosa River, will scarcely pay interest on the funded debt for the first ten years.

Progress in the Science of Lighting

Dr. Edward P. Hyde, director of the physical laboratory of the National Lamp Division of the General Electric Company, Cleveland, Ohio, gave a lecture before the Finance Forum at the West Side Branch of the Young Men's Christian Association, New York, March 30, covering in an intensely interesting way some of the more spectacular phases of artificial illumination. His lecture opened with a short discussion of the advantages of private ownership of public utilities, showing what immediate bearing this has on the subject of lighting. He then spoke of the changed methods under which scientific investigation is carried on at the present time, particularly in connection with large industrial enterprises. Formerly, he said, such work was largely a matter of individual effort, but under the present industrial system the purely scientific work necessary to the progress of an industry is directed toward the interests of the industry. The result, according to Dr. Hyde, is a more complete differentiation of function in research laboratories and a further integration of results.

The growth of the profession of illuminating engineering was then described. The speaker explained how the tools of that art were discovered and perfected long before the real engineering phases of their proper application were thought of, and he said that the important branches of the art are those which involve matters of the physiological and psychological effects of light, rather than simply the measurement of intensities. The most interesting and instructive part of Dr. Hyde's talk was that in which he covered, with the aid of experimental demonstrations, the bearing on illumination problems of the three factors of intensity, position and color of the light source. Using various examples of sculpture, exterior and interior architecture, paintings, advertising signs and samples of cloth, he showed in a most convincing manner that the variation of either or all of the above factors means an entire change in the appearance of the subject illumined. Taking, for example, the head of the father in the Laocoön group, he showed that, by simply varying the direction from which the light struck the figure, its expression could be changed from one of calm dignity through a number of phases to one of intense agony. By changing the color of the light on a painting he showed how the detail can be brought out and also how the impression of depth can be produced. A specially interesting and mystifying effect

was brought out by Mr. Hyde in connection with the illumination of signs or pictures by monochromatic light. Under such conditions parts of a sign or picture which are entirely invisible with red light are brought out strongly by blue or yellow light, or vice versa.

American Water Works & Guarantee Company Reorganization

The stockholders of the American Water Works & Guarantee Company of Pittsburgh, Pa., recently received from the protective committee additional details of the reorganization plan, containing the statement that Mr. H. Hobart Porter, of Messrs. Sanderson & Porter, of New York and San Francisco, would accept the presidency of the reorganized company, to be known as the American Water Works & Electric Company. The new company will have $10,000,000 of 7 per cent cumulative first preferred stock, of which $5,000,000 will be issued at once; $20,000,000 of 6 per cent participating preferred stock, of which $10,000,000 will be issued at once; $10,000,000 of common stock, of which $7,000,000 will be issued at present, and $20,000,000 of collateral trust 5 per cent twenty-year bonds, of which $6,250,000 will be issued now and $3,700,000 will be available as collateral. Of the collateral trust bonds to be issued at once, $5,733,300 are to be reserved for exchange, par for par, against the first mortgage bonds of the California-Idaho Company and $516,700 are to be used to pay indebtedness of subsidiary companies. The amount of the bonds reserved as collateral is to cover the indebtedness of subsidiary companies to bank creditors.

An interesting discussion of the situation that confronted the protective committee is given by that body. After stating that the company, which was organized in 1891, had for many years conducted a successful business in the ownership and operation of water plants and also had a controlling interest in the West Penn Traction properties, the value and earning power of which had been demonstrated, the committee says:

"The company had, however, during a period of some six years prior to the receivership engaged in irrigation projects in the Far West to an extent and in a manner disproportionate to its resources. It was liable as a guarantor upon approximately $20,000,000 in mortgage bonds of such irrigation companies, all of them maturing serially year by year. It had been anticipated that the heavy requirements for principal and interest upon these obligations and for the operation and development of the irrigation properties would be met by deferred payments by settlers upon the lands. The payments collected, however, fell far short of these requirements and the deficiency had reached large proportions. The company had thus invested in these projects, in addition to the outstanding bonds, upward of $10,000,000, represented by the floating debt of the irrigation companies held by the American Water Works & Guarantee Company. In addition thereto, the American Water Works & Guarantee Company had indorsed and rediscounted with third parties large amounts of paper of those companies for payment of which it was liable. Not only had the American Water Works & Guarantee Company invested in the properties substantially all the cash received from the sale of its entire issue of preferred stock, but it had used in these enterprises funds which could otherwise have been applied to the current needs of its profitable public service properties, with the result that at the time of the receivership each of its subsidiary companies was stripped of working capital and was indebted to banking institutions upon notes which the American Water Works & Guarantee Company had indorsed to the total net amount of approximately $3,050,000. In addition to these entanglements, the American Water Works & Guarantee Company had pledged, as collateral to its guarantee of irrigation bonds of the California-Idaho Company, the major portion in value of its assets."

By the terms of the reorganization plan, the California-Idaho bondholders are to exchange their present bonds for new 5 per cent twenty-year collateral trust bonds of the reorganized company, par for par against present holdings. The holders of the other four irrigation issues, aggregating $14,097,800 in principal amount, are to be paid $1,000,000 for the release of their guarantee. The bondholders will receive 51 per cent interest in the equities remaining in these properties after the payment of principal and interest on their bonds, the new company receiving 49 per cent interest therein. Under the reorganization plan there have been no changes in the capitalization of the subsidiary companies. All of the assets will be taken over by the new company, but there will be no guarantee by the new company on any subsidiary issues, all the guarantees of the old company being canceled and released.

Bank creditors, whose paper to the amount of $3,050,000 has matured, have agreed to accept for a portion of that paper twenty-year 5 per cent collateral trust bonds of the reorganized company at 87½, the remainder being renewed and extended over a total period of six years.

The reorganized company expects to raise $4,500,000 through present stockholders by subscriptions to new stock and by assessments on stockholders who do not subscribe. All assessments must be paid in full on or before April 27, 1914, and in case of default present stockholders will forfeit all interest in the reorganization. Subscriptions to new stock may be paid in full on or before April 27, 1914, or in instalments ending Oct. 27, 1914, and any stockholders failing to subscribe or pay the first instalment of their subscriptions on or before April 27, 1914, will forfeit all interest in the reorganization.

The committee has caused an underwriting syndicate to be formed, which has underwritten the $4,500,000 to be provided and has agreed to take and pay for all stock not subscribed for by the stockholders. This underwriting, however, has not been carried on by a strictly banking syndicate but has been participated in generally by banking firms and individuals, both here and abroad.

Upon the full consummation of the reorganized plan, it is anticipated that the new company will possess, among others, assets consisting of $2,000,000 of cash and $6,233,300 of first mortgage bonds of the California-Idaho Company, which bonds are a prior lien upon 33,000 acres of land in California. The $2,000,000 of cash is the amount estimated to be left from the working capital subscribed after acquiring the properties, paying creditors and all organization and reorganization expenses. Through its ownership of the capital stock of the United Water & Light Company, the reorganized company will own directly or indirectly $42,011,500 of the outstanding stock of thirty-five electric-light, water-works and traction companies and one coal company. These companies together have $59,585,000 of capital stock outstanding, $1,385,000 of which is pledged under the mortgage of the United Water & Light Company.

Messrs. Sanderson & Porter estimate the earnings of the new company for the first full year's operation and income from securities held as follows: Earnings received and accrued are placed at $1,500,953, and $500,000 is allowed for amounts to be left with sub-

sidiary companies and for general expenses of the new company. Interest on the $6,250,000 of collateral trust bonds of the new company, amounting to $312,500, is then deducted, leaving $688,453. From this is deducted $350,000 for the first preferred dividend, leaving a balance of $338,453 for the participating preferred and common stocks.

The president of the reorganized company, as noted above, will be Mr. H. Hobart Porter, and the following directors have been chosen: Messrs. E. C. Converse, A. H. Wiggin, Samuel Insull, Guy E. Tripp, James D. Mortimer, William Nelson Cromwell, H. Hobart Porter, J. B. Finley, W. B. Schiller, Charles R. Scott, H. J. Delanoy Meijer, Theodore Revillon, H. C. Huffer, Jr., Andrew V. Stout, Charles H. Payson, Henry Russell Platt and Henry H. Pierce. It will be noticed that the above list does not contain the names of any in the old board of directors of the American Water Works & Guarantee Company. No information is as yet available in regard to the other officers of the new company or the personnel of the voting trust to be chosen by the reorganization committee.

According to a decree entered in the United States Circuit Court in Pittsburgh on March 16, the receivership will be closed by the sale of the assets of the company on April 15, 1914. The upset price is $1,000,000, and the stockholders' protective committee proposes to buy in the property in accordance with the reorganization plan.

Halt in the Anti-Trust Legislation Program

President Wilson's fight for the repeal of the tolls exemption clause of the Panama Canal law, which was settled last week so far as the House of Representatives is concerned by the passage of the Sims bill, caused a halt in the consideration of the administration's proposed anti-trust legislation among committees of Congress and at the White House.

Just what effect the canal tolls fight in the Senate will have on the prospect of passage of anti-trust legislation at this session of Congress it is said to be too early to state, but in Washington it is realized as a fact that the proposed canal legislation is certain to act as a drag among the legislative program ambitiously mapped out not long ago, which included early passage of the anti-trust laws and an adjournment in June.

The House, having passed the Sims repeal bill, is in better shape for consideration of anti-trust legislation than the Senate. The trade commission bill has been introduced in the House, by order of the committee on commerce, and Representative Covington, of Maryland, chairman of the committee in charge of it, stated to a representative of the *Electrical World* in Washington that he intends to introduce in the House the middle of next week, probably Wednesday or Thursday, a printed argument which has been prepared by his subcommittee outlining the legal effect of the provisions of the bill and elaborating upon them.

In the House judiciary committee there are four measures, one amending the Sherman law, one defining the Sherman law, one regulating holding companies, and one prohibiting interlocking directorates. That committee has ended the hearings which have been held on these measures. They have never reached any stage beyond being submitted to the committee as "committee prints." An agreement has been reached not to hold any more hearings.

At the office of the judiciary committee it is stated that the members are considering these measures right along, but that when a report is to be made on them Chairman Clayton does not know, nor do the members of the committee. It will be necessary, it is stated, for the President to hold conferences with the members of the committee before any attempt is made to draft new bills in the place of the "committee prints" which have been used as a working basis.

One other committee, the Senate committee on interstate commerce, has before it proposed anti-trust legislation. This committee, of which Senator Newlands is chairman, has appointed a sub-committee of seven to draft one entirely new short bill which will deal with all the proposed anti-trust legislation. Senator Newlands is chairman of this sub-committee, and he states that the new bill will be ready for submission in about a week.

Under this bill will be consolidated all that Senator Newlands' committee purposes to do as to anti-trust legislation. The proposed measure will contain a paragraph on interlocking directorates and one on holding companies, but it will not contain, it is stated for the purpose of this article, any paragraph attempting to define the Sherman law or amending that law. It will be a short measure, one brief paragraph being devoted to each subject.

In view of the fact that the Senate has no rules committee, such as that of the House, which can limit debate on any subject, and in view of the fact that Republican Senators state they desire full and free debate on any proposed anti-trust legislation at this session of Congress, when the legislative and political situation with respect to the Senate's consideration of the tolls repeal bill is considered, it is, all in all, quite possible that the anti-trust legislation may go over to the next session. This possibility receives additional weight from the fact that such bills as do come from the House to the Senate will probably contain amendments to or definitions of the Sherman law the necessity for which many Senators doubt.

Tube Lighting

Mr. D. McFarlan Moore read an interesting paper on tube lighting at a meeting of the New York Electrical Society on March 31. The speaker outlined briefly the progress and the development in the last twenty-one years of lamps using gaseous conductors for obtaining light, and he gave some interesting figures telling of high efficiencies attained. Mr. Moore interspersed his remarks with a number of lantern slides which illustrated the various steps in the development of the Moore tube lamp. Various types of apparatus were also used to demonstrate the applicability of gaseous-lighting units to modern industrial conditions. Neon, nitrogen and carbon-dioxide lamps were used. The comparison of varicolored textiles and woolen goods first under a carbon-dioxide lamp and then under an ordinary tungsten lamp was of interest and showed how, with the former, colors could be selected under average daylight conditions. Mr. Moore showed also how one can easily be deceived in the selecting of meats or in determining the degree of inflammation of any diseased part of the body by depending on the usual artificial light.

Dr. Frederick G. Keyes, of the Cooper Hewitt Electric Company, discussed briefly high-pressure mercury-arc lamps. He first outlined the history of fused quartz and its use in connection with mercury-vapor arc lamps. The speaker then spoke of the ultra-violet rays emitted by the quartz tube lamp and described the ability of these rays to destroy injurious micro-organisms.

New York Meeting of American Electrochemical Society

The twenty-fifth general meeting of the American Electrochemical Society will be held in New York City April 16 to 18, 1914, with headquarters at the Chemists' Club, 52 East Forty-first Street. There will be technical sessions Thursday morning and afternoon and on Saturday morning and afternoon. Friday will be given over to an all-day excursion by steamboat around New York Harbor and Staten Island, combined with visits to the plants of the American Smelting & Refining Company, the United Lead Company and the Waclark Wire Company. The arrangements for the meeting are in the hands of the New York Section of the society, and the smoker scheduled for Thursday night and the steamer party on Friday are complimentary affairs tendered by the section. On Saturday evening a dinner dance will be held in the Chemists' Building.

Following is the program of the technical sessions:

Thursday, April 16, 9 a. m.—Rumford Hall, Chemists' Building: Annual business meeting, followed by symposium on power problems in electrochemistry. Dr. C. P. Steinmetz, "Characteristics of Electrical Energy as Affecting Chemical Industries"; Mr. P. Sothman, "Efficiency of Power Transmission Versus Utilization in Local Electrochemical Industries"; Mr. F. A. J. FitzGerald, "Economies in Electric-Furnace Operation"; Mr. W. S. Horry, "Power Supply to Electric Furnaces"; Mr. Lawrence Addicks, "The Power Problem in the Electrolytic Deposition of Metals"; Mr. H. E. Longwell, "Mechanical Aspects of the Power Problem in the Electrolytic Deposition of Metals"; Mr. F. D. Newbury, "Sources of Direct Current for Electrochemical Processes."

Thursday, 2 p. m.—Rumford Hall, Chemists' Building: Mr. Wilder D. Bancroft, "Electrolytic Flames" (an experimental lecture); Mr. C. A. Hansen, "Electric Steel Castings"; Mr. Eugene B. Clark, "Electric Furnaces for Steel Making"; Mr. G. C. Stone, "Improvements in the Metallurgy of Zinc"; Mr. W. R. Ingalls, "Electric Zinc Smelting"; Mr. W. P. Lass, "Advantages of Southeastern Alaska for Hydroelectrochemical Industries."

Thursday, 8 p. m.—Rumford Hall, Chemists' Building: Dr. E. F. Roeber, "Some Economic and Esthetic Aspects of Electrochemistry" (presidential address).

Thursday, 8:45 p. m.—Smoker, the delegates to be the guests of New York Section.

Saturday, 9 a. m.—Earl Hall Columbia University: Mr. E. A. C. Smith, "Progress in Leaching and Electrolytic Treatment of Copper Ores in South America"; Mr. Robert R. Goodrich, "Hydro-Electrometallurgy of Copper"; Mr. Rudolph Gahl, "Leaching of Copper Tailings"; Mr. Ralph W. Deacon, "Metal Inventory in an Electrolytic Copper Refinery"; Dr. Joseph W. Richards, "Electrolytic Zinc"; Messrs. O. P. Watts and A. C. Shape, "Addition Agents in the Deposition of Zinc from a Solution of Zinc Sulphate"; Messrs. Frank C. Mathers and O. Ralph Overman, "The Effect of Addition Substances in Lead-Plating Baths"; Messrs. Frank C. Mathers and Hugh M. Marble, "Electrodeposition of Cadmium"; Messrs. C. W. Bennett, H. C. Kenny and R. P. Dugliss, "Electrodeposition of Nickel"; Messrs. C. W. Bennett and A. W. Davison, "Electrolytic Deposition of Brass on a Rotating Cathode"; Mr. Gustave E. F. Lundell, "A New Method for the Determination of Free Cyanide in Electroplating Solutions."

Saturday, 2 p. m.—Earl Hall, Columbia University: Dr. E. F. Northrup, "Electric Conduction at High Temperatures and Methods of Measurement" (experimental lecture); Mr. F. A. J. FitzGerald, "Laboratory Notes on Some Electrical Properties of Silver Sulphide"; Mr. Claude N. Hitchcock, "Polarization Single Potentials"; Mr. Reinhard Beutner, "New Cell Arrangements for Direct Determination of the Free Energy"; Mr. R. Stuart Owens, "Experiments on White Lead"; Mr. Oliver W. Storey, "A Microscopic Study of Electrolytic Iron"; Messrs. O. P. Watts and M. H. Li, "The Effect of Addition Agents in the Electrodeposition of Iron"; Mr. O. L. Kowalke, "The Permanency of Base-Metal Thermocouples as Affected by Their Microstructure."

Saturday, 7 p. m.—Dinner-dance, the Chemists' Building.

Joint National Committee on Electrolysis

The joint national committee on electrolysis, which held its preliminary meeting in New York on May 27, 1913, is now made up as follows:

American Electric Railway Association—Mr. R. P. Stevens, president Mahoning & Shenango Railway & Light Company, Youngstown, Ohio; Prof. A. S. Richey, consulting engineer and professor of electrical engineering Worcester Polytechnic Institute, Worcester, Mass.; Mr. Calvert Townley, assistant to the president Westinghouse Electric & Manufacturing Company, New York.

American Railway Enginering Association—Mr. E. B. Katté, chief engineer electric traction New York Central & Hudson River Railroad Company, New York; Mr. D. J. Brumley, engineer of maintenance of way Illinois Central Railroad Company, Chicago; Mr. W. I. Trench, division engineer Baltimore & Ohio Railroad Company, Baltimore.

National Electric Light Association—Mr. Philip Torchio, chief electrical engineer New York Edison Company, New York; Mr. L. L. Elden, electrical engineer Edison Electric Illuminating Company, Boston, Mass.; Mr. D. W. Roper, assistant to chief operating engineer Commonwealth Edison Company, Chicago.

American Telephone & Telegraph Company—Mr. H. S. Warren, electrical engineer, New York; Mr. F. L. Rhodes, outside plant engineer, New York; Mr. A. P. Boeri, protection engineer, New York.

American Institute of Electrical Engineers—Mr. B. J. Arnold, consulting electrical engineer, Chicago; Mr. F. N. Waterman, consulting engineer, New York; Mr. Paul Winsor, chief engineer motive power and rolling stock Boston Elevated Railway Company, Boston.

National Bureau of Standards—Dr. E. B. Rosa, chief physicist, Washington, D. C.

Natural Gas Association—Mr. C. B. Olyphant, Iroquois Natural Gas Company, Buffalo; Mr. W. J. Broder, Columbus, Ohio; Mr. Forest Towle, New York.

American Gas Institute—Prof. Albert F. Ganz, consulting engineer and professor of electrical engineering Stevens Institute of Technology, Hoboken, N. J.; Mr. J. A. Gould, engineer of distribution Boston Consolidated Gas Company, Boston; Mr. Jacob D. von Maur, superintendent of distribution Laclede Gas Light Company, St. Louis.

Mr. Bion J. Arnold is the chairman of the joint committee. The second and third meetings of the committee were held in New York at the rooms of the American Institute of Electrical Engineers on Feb. 25 and 26. Messrs. Townley, Katté, Warren, Roper, Waterman, Ganz and Broder were confirmed as members of the committee on plan and scope of the investigation. Mr. Townley, addressing the gentlemen present, gave a general idea of the questions which it is proposed that the committee shall consider broadly. It is not proposed that the joint committee shall come to definite

conclusions upon the questions at issue, but rather report back to the respective organizations represented on the joint committee, so that in time the committee would come to be recognized as a neutral body whose decisions would be authoritative. It is not proposed that the joint committee shall act as a board of arbitration in controversies.

At the meeting of Feb. 26 it was voted that Dr. E. B. Rosa, the representative of the National Bureau of Standards, be appointed secretary of the joint committee and a member of the plan and scope sub-committee. The sub-committee on plan and scope presented a preliminary report and a resolution, which was adopted, providing that the chairman appoint sub-committees to collect information and that the committee on plan and scope be continued. Chairman Arnold thereupon announced the appointment of the following sub-committees:

Principles and Definitions—Messrs. Rosa (chairman), Brumley, Stevens and Boeri.

Methods and Analyses of Surveys—Messrs. von Maur (chairman), Olyphant, Elden, Rhodes and Winsor.

Foreign Practice—Messrs. Torchio (chairman), Towles, Trench, Townley and Gould.

Domestic Practice—Messrs. Waterman (chairman), Broder, Ganz, Roper, Richey, Katté and Warren.

Minnesota Electrical Association at Minneapolis

In the *Electrical World* of March 28 was given a brief account of the seventh annual convention of the Minnesota Electrical Association, held in Minneapolis, March 18, 19 and 20. Further details of this convention, together with abstracts of papers read and addresses delivered, are given below.

Motor Applications

Mr. C. W. Drake, of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., gave a paper on "Motor Applications." He mentioned the fact that new-business departments are maintained by few electric-service companies in cities of less than 50,000 population. In Minnesota about 400,000 hp is used in manufacturing industries; possibly 25 per cent of this is supplied by electric-service companies, although this is rather a rough estimate. Discussing various classes of industries, Mr. Drake said that small planing mills make excellent "prospects" for central-station business. Paper mills are not so good. Miscellaneous industries present, perhaps, the best opportunity. Over 90 per cent of the industrial applications of the electric motor may be met by the use of standard-slip, constant-speed squirrel-cage alternating-current motors. However, direct-current motors are required where adjustable speed is needed, and the use of direct-current motors for this purpose is increasing. Electric motors used to drive machinery should be large enough; they may not show distress but still be too small. The speaker exhibited a large number of interesting lantern-slide pictures illustrating motor applications. He mentioned the fact that usually, but not always, flour mills are driven by one motor. He illustrated one such mill operated by a 1000-hp motor wound for 13,200 volts. Another promising and interesting use of the electric motor is in supplanting steam pumping engines in city water-works. Brick and tile works and paper mills furnish promising prospects. The speaker illustrated a large number of electrically driven machine tools.

Relations with the Public

Mr. R. F. Pack, general manager of the Minneapolis General Electric Company, read a thoughtful paper on "The Public and Public Service Corporations." It was a condensation of a previous paper on the same subject read before the Minnesota Section of the American Institute of Electrical Engineers. The speaker noted that as a rule the customers of a public utility corporation are more friendly to it than are the remainder of the citizens. This proves that closer relations with the corporation result in a greater appreciation of the service rendered. To illustrate that private ownership makes for progress, Mr. Pack quoted from Mr. Samuel Insull, president of the Commonwealth Edison Company of Chicago, giving a comparison between the results of the Chicago company and the combined results of three hundred electric-service plants operating in Great Britain. The accompanying table shows these results tabulated, the figures being for 1912:

COMPARATIVE DATA FOR COMMONWEALTH EDISON COMPANY AND 300 BRITISH PLANTS

	Great Britain	Chicago
Population served	24,259,261	2,185,283
Investment	$310,013,189	$68,284,495
Income	$40,585,860	$15,361,649
Income per capita	$1.67	$7.03
Kilowatt-hours sold	1,127,499,742	712,193,636
Kilowatt-hours sold per capita	46.47	325.90
Income per kilowatt-hours, cents	3.60	2.16
Operating expense per kilowatt-hour, cents	1.76	1.17
Number of years required to turn over capital	8	4½
Nature of business	Mainly lighting	Mainly motor service

Mr. Pack said that the electric-service companies must be frank in the conduct of their business and appeal to the people. He made a strong plea for the allowance of intangible values in the valuation of plants and declared that intelligent and fair regulation should be welcomed, but that regulation should not restrict the necessary flow of capital into the business. Taxes can more justly be assessed on the basis of gross income than on the value of the property. Mr. Pack quoted Mr. Arthur S. Huey, vice-president of H. M. Byllesby & Company, to show what should be the obligations of the company and what should be expected from the public. He closed by earnestly recommending the raising of the load-factor. There is more money, he said, in selling electricity at 2 cents per kw-hr. for twenty-four hours a day than at 15 cents or 20 cents per kw-hr. for one hour.

Electrical Extension Work of the University of Minnesota

Prof. W. T. Ryan, of the University of Minnesota, described the extension work of the university in relation to electrical activities. Four lectures have been prepared for delivery throughout the State. Three of these, by Prof. George D. Shepardson, have the following subjects: "Use of Electricity in the Home," "Transmission of Intelligence" and "Use and Abuse of Light." The fourth, by Professor Ryan, is on "Methods of Charging for Electricity and the Economic Use of Electricity." Professor Ryan gave a synopsis of this lecture, which has not yet been delivered in the extension course. It is prepared for non-technical audiences, but is a carefully considered explanation of the various methods of charging used in the sale of electricity.

Mr. Pack praised warmly the extension work of the University of Minnesota. Professor Shepardson said that the department of electrical engineering in the university wants to be of the greatest possible value to the electrical interests in the State. The four lectures available should be of decided value partly because the hearers will have more confidence, perhaps, in what a university professor says than in the statements of one

interested in the sale of electricity. Professor Shepardson recommended the appointment of a committee on education by the Minnesota association, following the plan of the National Electric Light Association. On motion of Mr. M. A. Pocock, of St. Paul, the association voted that such a committee be appointed.

Modern Developments in Electric Lighting

Mr. S. E. Doane, of Cleveland, chief engineer of the National Electric Lamp Association, gave an interesting and instructive talk on four recent developments in electric lighting. The first of these was the advent of the high-candle-power, high-efficiency tungsten-filament lamp. Roughly, the efficiency of the lamps will vary as the amperes consumed. The question whether the lamps should be used with transformers or compensators must be settled in each individual case. The lamp presents an advance in efficiency which is greater than the figures of watts per candle would indicate, because the relation between horizontal and spherical candle-power approaches unity. The outdoor applications of this lamp are most interesting. The lamp will probably displace all other high-candle-power illuminants.

The second topic treated by Mr. Doane had to do with European practice in relation to the cultivation of very small lighting customers by electric-service companies. A very interesting description was given of the methods used to supply the meterless, flat-rate customers in Milan, Italy, who are connected to the number of perhaps 50 kw or 60 per kw of demand. The inexpensive wiring used was also described. This is cheap in price but apparently perfectly safe. The Milan company finds it advisable to get the small customers first and then go after bigger ones. Mr. Doane said that it is not uncommon for servants to induce their mistresses to use electric light by saying that they, the maids, have it in their own homes.

As his third subject, Mr. Doane touched briefly but emphatically upon the necessity of maintaining constant voltage on customers' circuits. He pointed out what it means quantitatively in loss of net revenue to permit the line potential to drop 3 volts or 4 volts.

The fourth subject of the address was the proposal that roads between cities and towns be electrically lighted where pole lines exist. There are many pole lines on country highways, and with the present low cost of electricity and the high efficiency of the high-candle-power lamps, the speaker does not see why their roads should not be electrically lighted in some sections. This, at any rate, is a prospect of the future.

Speaking generally, Mr. Doane said that the cost of making electricity in Europe is perhaps higher than in the United States. Americans are disposed to think of European labor as cheap, but it is constantly increasing in price and is, perhaps, not so effective as American labor. In their overhead construction it is to be remembered that the Europeans in many countries do not have to contend with the climatic conditions, such as sleet storms, encountered in many parts of the United States. It is to be borne in mind also that the principal cost in the making of electricity is the interest on the investment. In Europe the company generating the electricity is often distinct from the company distributing and selling it.

Discussion

In the discussion Professor Shepardson, Messrs. T. D. Crocker of Minneapolis, F. E. Brown of Mankato, B. M. Howard of Winona, A. H. Dickerson of Windom, P. T. Glidden of St. Paul, B. W. Lynch of Minneapolis, W. R. Haney of Warren and others took part. In answer to questions Mr. Doane explained that the very small flat-rate lighting customers in European cities are "feeders" for meter customers. He told of electric cooking in London restaurants, the cost being equivalent to gas at 50 cents per 1000 cu. ft. In some sections of London electricity for heating is charged for by a fixed annual charge, paid in advance, and at very low measured rate for the energy consumed. English central-station men say that the flatiron and the electric stove are the most valuable of the electric-heating devices in bringing in revenue.

The amount paid by the very small customers in Milan, said Mr. Doane, amounts to perhaps 6 cents or 7 cents per kw-hr. The limiting device causes flickering if the limit is exceeded; by turning off a lamp satisfactory service is re-established. Mr. Doane announced that a limiting device such as that used in Italy and costing perhaps $1.50 is being brought out by the National Electric Lamp Association, but the speaker expressed the hope that other manufacturers would do the same, for the good of the industry. In answer to another question, the speaker said that the central-station companies in Europe financed small customers for a long term of years, that is, spread the initial cost over a long term, receiving perhaps 10 per cent for their money. In Italy the central-station companies think they make money from the very small customer if they receive from him over 30 cents a month. In Strassburg, Germany, this limit is placed at $4.50 a year.

Mr. Doane described the methods of wiring used for these very small customers. Different plans are employed, but all cluster about the one central idea of helping the customer. Mr. Crocker dwelt upon the importance of getting electric service to the masses of the people. He thinks, however, that customers should pay for the wiring and get a fairly low rate for service. Mr. Howard told of the plan he is adopting for "intensive cultivation" in Winona. The city is divided into districts and a solicitor assigned to each. These men are instructed not to overlook anybody. The political effect of a large number of very small customers is important, as the company has very little trouble with its own customers. Mr. Dickerson wanted further light and wished to know if the limiting devices would discourage the use of flatirons and other current-consuming devices. Perhaps, he said, it would be better to reduce the minimum rates. Mr. Glidden said that perhaps all central-station men are apt to lay too much stress on the return per kilowatt-hour.

Co-operation

Mr. W. C. Beckjord, of St. Paul, read the paper of Mr. M. J. Wolf, of the Chicago office of the Hot Point Electric Heating Company, in the absence of the author. Mr. Wolf said that co-operation should be a vital, active force; it should be constructive and conducted on a personal basis. All interested in the electrical business should co-operate with the central-station company.

Visit to the University

One of the pleasant features of the convention was an excursion on the afternoon of March 19. Under the guidance of Professor Shepardson, who is professor of electrical engineering of the University of Minnesota, the convention visitors made a visit to the university. By a coincidence a rather unusual spectacle was staged for the benefit of the electrical men. In tearing down an old heating plant on the campus it was necessary to demolish a brick smokestack 9 ft. square at the base and 85 ft. high. This was done by taking out part of the brickwork in the base and filling it with timbers. These timbers were set on fire in the presence of the visitors, and at length, with a great crash, the stack toppled over to the ground. The visitors were then

conducted to the Hall of Mechanic Arts, where Dr. George E. Vincent, president of the University, gave a brief address. Dr. Vincent requested his hearers not to fail to remember the value of what is sometimes termed mere theory. He urged fair treatment and a fair regard for the man who pursues truth because he loves truth. Every "practical" man, too, can follow intellectual curiosity. Indeed, anything that is "practical" is based on some intelligent theory. The president of the university explained how the school desires to enter into the life of the State.

Professor Shepardson, speaking of the electrical features of the university, said that part of the electrical energy used was produced in the university generating plant (designed also to be of educational value to engineering students) and part was purchased from the Minneapolis General Electric Company. There is practically no difference in the cost of the purchased and home-made energy. The visitors were escorted through the new heating plant, shown the rock tunnels for underground utilities, and taken to the electrical and mechanical engineering laboratories.

Twin Cities Men Entertain at Dinner

On the night of March 19 the electrical manufacturers and dealers of Minneapolis and St. Paul gave a complimentary dinner at the Hotel Radisson, where the convention was held, for the active members of the Minnesota Electrical Association. About 250 men sat at the tables, which were ingeniously decorated with a miniature pole line, energized, apparently, by a small generating plant on the speakers' table. Miniature street-lighting standards on the tables added to the effect. Mr. C. D. Wilkinson, chairman of the committee in charge, presided, and Mr. R. M. Laird read a prospectus of the Society for Electrical Development. Messrs. J. L. Barnard and Leo Cooper were the other members of the committee. A vaudeville entertainment followed the dinner.

Accounting

A carefully prepared paper on accounting was read on March 20 by Mr. F. C. Hoffman, of the St. Paul Gas Light Company. The speaker pointed out that analysis of accounts is particularly valuable when rate investigations come up, as they are pretty sure to do, sooner or later. He gave considerable attention to the distribution of expenses. Mr. Hoffman made the point that the public is quick to blame and slow to praise the utility company. This, he contended, is a good thing, because it keeps the utility man on the alert.

Safety First

Mr. John P. Gardiner, assistant commissioner of the Minnesota Department of Labor and Industries, read a paper on the "safety first" movement in Minnesota. The safety law in that State is a drastic one, according to the speaker. Employers are responding cheerfully and employees are co-operating fairly well, but not to to extent desired. The department prides itself on getting results without invoking the law. Mr. Gardiner dwelt earnestly on the need of personal caution; thinking must supplement mechanical devices. The speaker gave particular attention to accidents due to emery wheels, set screws for shafting and protruding nails in boards.

Concluding Business

Mr. A. G. Munson, of St. Paul, brought up the subject of the theft of electricity and asked the association to lend its influence to the enforcement of existing laws to prevent this crime or the adoption of a new law if necessary.

Public Service Commission News

New York Commissions

Governor Glynn of New York has filled three vacancies in the Public Service Commissions of the State. Mr. George M. Schulz was nominated for appointment to the Public Service Commission of the First District of New York to succeed Mr. John E. Eustis, whose term of office has expired. He is forty-five years old and a native of New York City. He was educated in the public schools and was graduated from the College of the City of New York in 1892 and from the New York Law School two years later. He was admitted to the bar at once. Mr. Schulz was elected surrogate of Bronx County on the Democratic ticket last year. Before that he was a city magistrate, having been appointed by the late Mayor Gaynor. He had represented the district in which he lives in the Assembly and in the Senate. Mr. Frank Ervine, professor of law at Cornell University, and Mr. William Temple Emmet were nominated for appointment to the Public Service Commission of the Second District of New York.

Maryland Commission

The Maryland Public Service Commission has authorized the Consolidated Gas, Electric Light & Power Company to issue $1,106,800 additional consolidated mortgage debenture stock bearing 5 per cent interest with the privilege of conversion at the option of the holder into common stock on the basis of par for the debenture stock and 121½ for the common stock. The commission also authorized the company to issue "when and as needed for the conversion of the debenture stock" $909,800 additional common stock. Because of a question raised by the commission's counsel the decision in the case was delayed in order that the point raised might be thoroughly sifted. This point related to the authority of the commission to sanction the conversion feature of the debenture stock at a fixed price three years hence, but after a study of various authorities this doubt was removed.

Indiana Commission

It is reported in Indianapolis that the Public Service Commission of Indiana will not interfere with certain electrical utilities in Indiana that are operating under particular forms of franchises giving contractual rights that members of the commission believe cannot be abridged under the law. Such cases exist at Lafayette, Gary and several other of the larger cities of the State. The commission, one member declared, would hold, in these instances, that it has no power to set aside a specific contract regarding rates.

The Lafayette case has attracted much attention. The large consumers of power at Lafayette are attempting to make a settlement of the rate issue, and it appears that an agreement will be made that will keep the case out of the commission's jurisdiction. A decision in the Lafayette case had been written by the commission but not made public. When it became known that an agreement was being considered between the company and consumers the commission withheld its decision.

The commission has authorized the execution of a new mortgage for $500,000 by the Indiana Fuel & Light Company, which operates plants at Kendallville, Auburn and Garrett. Of this amount $200,000 bonds are to be used to retire outstanding bonds and $75,000 are for construction and extensions. The $75,000 bonds may not be disposed of at less than 85.

Ohio Commission

The Public Utilities Commission of Ohio has issued a supplemental order on the application of the Dayton

Power & Light Company for authority to issue preferred stock. The company asked for authority to issue preferred stock to pay for the partial cost of the reconstruction of its plants and property and for the extraordinary expenditures, beyond the normal, made necessary to operate its property during and subsequent to the flood of March, 1913.

After consideration of the testimony, it appeared that the money to be secured by the sale of the stock was to be used for the payment of the partial cost of reconstruction and the rehabilitation of service and that these were necessary for maintenance of the service. The commission therefore was satisfied that so much of the petition as sought its consent to the issue and disposition of preferred stock of the further sum of $271,500 should be granted.

The company was therefore authorized to issue this amount of stock, in addition to the amount authorized on Feb. 17, 1914. The commission stipulated that the stock should be sold for not less than 80. It was also ordered that upon issue of this stock the company reduce its outstanding common stock by retiring $200,000 thereof.

Georgia Commission

In its decision on the application of the Macon Railway & Light Company to restore rates in Macon to a proper basis, they having been demoralized by competition in the past two years, the Georgia Railroad Commission asserts its belief that where there is governmental regulation and control of public service corporations it is the duty of the government to protect such corporations in the exercise of their rights and franchises.

After permitting the restoration of rates to an equitable basis the commission said:

"We do not believe competition can ever be a consistent and proper regulator of rates and other conditions in the public utility field. Real competition in such a field means duplication of plants, which when once built are generally useless for other purposes. In our opinion, the government, which properly assumes to prescribe reasonable rates and compel adequate service by public utilities, should also protect such utilities and the public from unwise or useless competition and the wasteful investment of money in plants which are unnecessary.

"There is need, as there are opportunities, for great industrial developments in Georgia. To meet fully this need and to improve these opportunities, capital other than our own must be attracted. There is no surer way of doing this than at all times treating it and its owners fairly. There are risks and hazards in public utility investments not always carried by private enterprises. There should be recognition of this in prescribing rates; they should allow compensation therefor.

"Investors in public utility enterprises unquestionably surrender, or rather have to yield, to governmental agencies in the regulation and control of their rates and services. They are not free to do as they will with their property or to get what they can out of it. They are subject to the will of the people whom they serve, and having such powers, it seems to us that there should be recognition at all times of corresponding obligations for at least fair treatment."

California Commission

The Railroad Commission of California has given authority to the Pacific Gas & Electric Company to issue $7,000,000 of one-year 5 per cent notes, the notes to be secured by $5,000,000 of the company's general lien bonds and $5,000,000 of the company's general and refunding bonds. The notes will mature on March 25, 1915.

Current News Notes

Alliance Electric Show.—An electric show will be held at Alliance, Ohio, from April 14 to April 18. The present indications are that it will be a very successful affair. Much effort is being spent in this direction by the Alliance Gas & Power Company, of which Mr. W. J. Rose is manager and superintendent.

* * *

Green Wire for Decorative Lamps in Trees.—To render inconspicuous the wires used in connecting up lamps mounted in the foliage of trees at the Panama-Pacific International Exposition, San Francisco, 1915, special colored insulation will be used, making the festoons practically invisible both day and night.

* * *

An Electric-Truck Opportunity.—Each year horses worth $1,100,000 die in New York City, according to figures collected by the New York Edison Company. Had these animals been sold the money received would have bought 1000 electric trucks, each having a useful life of ten years as against the four-year life of the horse.

* * *

Panama-California Exposition Buildings Ready July 1.—Director-General H. O. Davis of the San Diego (Cal) exposition declares that all buildings for exhibits or concessions must be ready for installation by July 1, 1914. A reinforced viaduct over the Cabrello Canyon at the west entrance to the grounds will be completed shortly, giving easy access to the exposition buildings.

* * *

Examination for Electrician.—An open competitive examination for electrician will take place on May 6 at the usual places, as designated in the government circular. Applicants must be twenty years of age or over. Experience in the care, maintenance, repair and operation of station storage batteries is desirable. From the registers of successful candidates vacancies in the departmental service at Washington will be filled. The usual entrance salary for electricians is $4 a day. Those desiring to take this examination should write for Form 304 to the United States Civil Service Commission, Washington, D. C.

* * *

United States Commission on Industrial Relations.—Public hearings in thirty-five important industrial centers from New York to San Francisco will be held during the spring and early summer by the United States Commission on Industrial Relations, according to an announcement by Mr. Frank P. Walsh, chairman of the commission. Through the examination of witnesses competent to speak for employers, trades unions, other labor organizations, unorganized employees and the general public, the commission hopes to obtain information concerning the industrial situation that will lead to constructive recommendations.

* * *

Electrical Machinist.—The United States Civil Service Commission will hold an examination for electrical machinist on April 27. At present there are two vacancies for machinist to be filled, one in the Signal Service-at-Large, Fort Wood, New York, and one in the same service at Fort Mason, Cal. Each position pays $1,000 per annum. Applicants for these positions should be practical electrical machinists more than twenty years of age, with three years' or more experience, should have a knowledge of electricity, and must be competent to repair telephone and telegraph instruments, radio apparatus, etc. Persons desiring to take this examination should write to the United States Civil Service Commission, Washington, D. C., for Form 1800.

MINNEAPOLIS TO HAVE ELECTRICAL AND HOUSEHOLD SHOW.—Minneapolis is to have an electrical and household-appliance exhibition during the entire week commencing May 18. Mr. Charles E. Hansing, who is managing the undertaking, plans to make the electrical section one of the leading features of the show and desires to have every local electrical firm represented. Both the main Armory building and the annex will be used, thus affording ample space for elaborate electrical exhibits.

* * *

NOON-TIME RECREATION FOR CENTRAL-STATION EMPLOYEES.—A feature of the new hundred-thousand-dollar building of the Penn Central Light & Power Company, Altoona, Pa., is its fine assembly room which occupies one-half of the third floor. Seats are provided for 400 persons and at frequent meetings of employees topics of courtesy, public relations, welfare work, etc., will be discussed. The room is also equipped with a pianola and highly polished dance floor and the employees are privileged to listen to the music and to dance there daily between 12 noon and 1:30 p. m.

* * *

A GREAT CENTRAL-STATION LOAD.—On Dec. 31, 1913, the total connected load on the system of the Commonwealth Edison Company of Chicago was 908,204 hp. Of this amount 536,239 hp was motor load or industrial load, and 371,965 hp lighting load. The industrial load includes 255,629 hp, representing the load of the surface and elevated railways. During the year the power division of the contract department of the company closed power contracts amounting to 43,496 hp. The street-railway load was increased by 78,955 hp, and the increase in the lighting load was 54,877 hp. The total increase, therefore, was 107,328 hp.

* * *

COST OF HYDROELECTIC ENERGY IN THE NORTHWEST.—Statistics compiled by Chief Engineer F. S. Burroughs of the Public Service Commission of Washington show that the Washington Water Power Company at Spokane produces electricity at a lower cost than any other company in the State. The figures refer only to the costs incurred at the manufacturing stations. The cost per killowatt-hour generated at the switchboard of the Washington Water Power Company is 2.1 mills. The cost at other hydraulic plants is given as follows: Seattle-Tacoma Power Company, 3.1 mills; Lewiston-Clarkston Manufacturing Company, 3.7 mills; Wenatchee Valley Gas & Electric Company, 2.7 mills.

* * *

THE EFFICACIOUS ELECTRIC IRON.—A demonstrator for the United Electric Light & Power Company, New York City, who called at a customer's home to explain the proper method of using an electric iron, was met at the door by the maid and to her described the purpose of her visit. The maid replied that she herself knew well enough how to operate the iron, but she said she did not favor its use as it worked "so fast" and did the ironing in such a short time that her mistress afterward always found extra work for her to do. She hoped therefore that her mistress would not buy the iron. Not daunted, however, the demonstrator made the sale and has since been using the story in gaining other orders.

* * *

EXHIBIT OF PHYSICAL APPARATUS.—An exhibit of physical apparatus will be held at the Bureau of Standards, Washington, D. C., under the auspices of the American Physical Society on the occasion of the first joint meeting of the Physical Society with the American Institute of Electrical Engineers on April 24 and 25. At the same time the new electrical building of the Bureau of Standards will be informally dedicated. The exhibit, which will be similar to the eminently successful annual exhibits of the London and French physical societies, will be limited to recently developed lecture, laboratory and research apparatus, together with illustrative photographs, charts, etc. Dr. F. A. Wolff, of the Bureau of Standards, is secretary of the exhibit committee.

* * *

INTERNATIONAL ENGINEERING CONGRESS, 1915.—Rapid progress is being made in working out the final program of papers for the International Engineering Congress to be held at San Francisco in 1915. The first volume of the publication of the Congress will consist of a series of twenty-two articles descriptive of the various technical features of the design and construction of the Panama Canal. Colonel Goethals will write the general introductory chapter and also the article on dry excavation for the locks. Another chapter will treat of the electrical and mechanical installations at Panama.

* * *

DECREASE IN METER LOSSES.—At a recent meeting of the Commonwealth Edison Company Section of the National Electric Light Association Messrs. J. H. Perry and A. G. Turnbull read interesting papers on meters. The company has about 229,000 meters in service on customers' premises, and 323 employees are required in the meter department. A consumer of the size of Marshall Field & Company's retail store requires an installation of twenty printometers, which register half-hour dial readings on tapes. For a thirty-day period the coincident maximum from 28,800 readings on these instruments is calculated. Ten or twelve years ago shunt losses on alternating-current meters ran as high as 6 or 8 watt-hours, while on those purchased to-day the losses run from 1.5 to 2 watt-hours only.

* * *

ONLY ONE-TENTH OF OREGON'S AVAILABLE WATER-POWER USED.—According to data compiled jointly by the engineering department of the University of Washington and Engineer Burroughs, of the Public Service Commission, only 10 per cent of the water-power of the State of Oregon available for practical use has thus far been developed. Engineer Burroughs gives the total amount of hydraulic electric power now developed at 265,000 hp, of which 227,000 hp is developed by public service corporations and 38,000 hp for private commercial purposes. The engineering department of the University of Washington puts the theoretical average for the entire year that could be developed by utilizing all possible power at 13,125,000 hp. The practical figure given for the amount of power that could be developed all the year around at a cost not to exceed $1.50 per hp was 2,566,000 hp.

* * *

FUNERAL SERVICE HEARD BY QUARANTINED DAUGHTER.—A distressed husband and father, burying his wife, called on the Chicago Telephone Company and asked its aid in effecting a telephone connection from the church to the bedside of his quarantined daughter. Request for service was made at 10.30 a. m. and the funeral was to be held at 2 p. m. on the same day. Concealing a so-called "acousticon" or loud-speaking transmitter in the flowers before the pulpit and connecting it to the telephone line of the church, direct means of communication was established between the church and the central office. Here the subscriber's line and the church line were disconnected from the switchboards and tied in solid. The quarantined daughter was thus able to listen to her mother's funeral service as it was conducted in the church many blocks from her home. One of the features of this unusual feat in telephony was the quick work involved.

SOCIETY MEETINGS

NEXT CHICAGO REJUVENATION.—Mr. Homer E. Niesz, statesman for Illinois, announces that the next rejuvenation of the Jovian Order in Chicago will be held on May 11, probably at the Hotel Sherman.

* * *

CHATTANOOGA JOVIANS INITIATE BIG CLASS OF NOVICES.—The Jovians of Chattanooga, Tenn., now meet weekly at luncheon at the Commercial Club. At a recent rejuvenation the fifteen active members of the league who happened to be in town initiated a class of forty-six candidates. Mr. Paul J. Kruesi acted as toastmaster at the banquet which followed the ceremonies, and addresses were made by Messrs. Byron T. Burt, F. H. Cantrell, C. S. Steward, J. S. Kirkpatrick and E. D. Reed. The initiation was in charge of Messrs. J. L. Wilheite, F. H. Cantrell, P. W. Curtis, R. W. Dugger, Jesse Dugger, J. N. Slaughter, Carl Rigdon, N. C. Blanchard, I. L. Faucette and W. J. Hill.

* * *

NEW YORK ILLUMINATING ENGINEERING SOCIETY ACTIVITIES.—A meeting of the New York Section of the Illuminating Engineering Society jointly with the American Museum of Safety is to be held on April 9. A program that has been arranged includes papers on "Glasses for Protecting the Eyes in Industrial Processes," by Mr. M. Luckiesh, Cleveland, Ohio; "Illumination as a Factor of Safety in Industrial Plants," by Mr. R. E. Simpson, engineer Travelers' Insurance Company, Hartford, Conn.; "Railway Yard Lighting as a Factor of Safety," by Mr. J. W. Ensign, illuminating engineer New York Central Railroad, and "Some Reasons Why Red Is Not a Proper Color for Danger Signals," by Dr. William Churchill, of the Corning Glass Works. The committee for the prevention of blindness has been invited to discuss these papers.

* * *

BOILER MANUFACTURERS' CONVENTION.—The American Boiler Manufacturers' Association will hold its twenty-sixth annual convention in New York City, Sept. 1 to 4, 1914, with headquarters at the Waldorf-Astoria Hotel. All boiler, tank and stack manufacturers, fabricators of steel plate and manufacturers and representatives of materials and supplies used by boiler manufacturers are invited to attend the convention. The Supplymen's Association of the American Boiler Manufacturers' Association has completed a list of boiler, tank and stack manufacturers of the United States and Canada which is compiled in neat booklet form and contains names and addresses of more than 900 manufacturers. These books are offered to interested parties, such as tool and material manufacturers, at $3 per copy. The secretary of the association is Mr. F. B. Slocum, West and Calyer Streets, Brooklyn, N. Y.

* * *

BANQUET OF THE CHICAGO CENTRAL STATION INSTITUTE.—After being in existence one year the Chicago Central Station Institute gave a banquet on March 27 to the eleven men who had completed the course. Mr. E. W. Lloyd, the president of the school, spoke on the opportunities in the commercial field of the central-station business for young men. Mr. John F. Gilchrist, one of the directors, spoke on the development of the central-station industry, mentioning that first the engineer was the most valuable man but later the services of the commercial man became most desirable. Now, however, the speaker said, a man with a technical training and commercial ability is necessary to handle the central-station commercial problems. The future of the institute was outlined by Mr. Fred R. Jenkins, its secretary and manager, and Mr. H. L. Lincoln, chief instructor, spoke on personal power and load factors.

OHIO ELECTRIC LIGHT ASSOCIATION.—The 1914 convention of the Ohio Electric Light Association has been set for Cedar Point, Ohio, July 21 to 24. Among the papers to be presented are those on "Welfare Work in Industry," by Dr. Thomas Darlington, Iron and Steel Institute, New York, and "Electric Power—Its Advantages, Service and the Best Methods of Obtaining It," by Mr. J. H. Mitchell, Columbus Railway & Light Company, Columbus, Ohio. The following committee reports will also be given: Illumination, Mr. S. E. Doane, Cleveland; meters, Mr. A. H. Bryant, Cleveland; transmission, Mr. M. H. Wagner, Dayton, and new-business co-operation, Mr. M. E. Turner, Cleveland. The usual elaborate entertainment program has been outlined, but the executive committee has decided that no exhibits shall be permitted under the sanction of the association, either at the hotel or at the convention hall. Mr. J. C. Martin, of Wilmington, Ohio, is president of the association, and Mr. D. L. Gaskill, of Greenville, is secretary. The chairman of the committee of arrangements for the 1914 convention is Mr. E. A. Bechstein, of Sandusky.

* * *

ELECTRICITY AND THE FOURTH DIMENSION.—Prof. Philip B. Woodworth, dean and professor of electrical engineering, Lewis Institute, Chicago, speaking before the Chicago Jovian League luncheon on March 30, compared the action of the forces of gravitation, magnetism and electricity with the conception of the fourth dimension as expounded by Sir Oliver Lodge. Using a blackboard to demonstrate, Professor Woodworth explained the characteristics of the line, the square and the cube as applying to the first, second and third dimensions, and showed how man, a creature of the third dimension, is able to see nothing more concrete than squares. Just as a square, having no thickness, offers no resistance to the passage of a cube, so would a body of the third dimension offer no resistance to a body of the fourth dimension, declared Professor Woodworth. From this premise he showed further that gravity, magnetism and electricity found no barrier in certain substances of the third dimension. Contending, the speaker pointed out how these three phenomena, of which we see only the actions, might be substances of the fourth dimension.

* * *

ELECTRICAL CONFERENCE IN PHILADELPHIA.—The March meeting of the Electrical Conference was held March 26 at the meter department building of the Philadelphia Electric Company. Chairman Washington Devereux presded, and the speaker of the evening was Mr. D. Brookfield Wilson, of the General Electric Company, who gave an illustrated talk on the mercury-arc rectifier. The various economies to be effected by an intelligent investigation of the proposed installation, together with the installation of the proper number and size of rectifiers, were demonstrated by Mr. Wilson. Mr. Samuel Seata, chairman of the committee on fittings and devices, spoke of the failure of some fittings after use in the field, and about twelve fittings were shown that had failed in service. Among the number were porcelain pull-chain sockets, porcelain tubes, snap switches, molding fittings, etc. This talk and the discussion following brought out the fact that the contractor should consider well the character of material supplied by the manufacturer and jobber, as the loss due to defective material usually falls upon the contractor. The next meeting of the conference will be held April 23. The speaker will be Mr. R. Maitland Nesbitt, of the Philadelphia Fire Underwriters' Association, and the subject will be "Iron Conduit, Its Manufacture and Use."

Savannah Electric Company's Turbine Station

Features of 11,000-kw Riverside plant built for economical operation in the South—Condensers, boiler-feed pumps and auxiliary units on turbine-room floor—Steam header on boiler-room floor

THE Riverside station of the Savannah (Ga.) Electric Company, which has now been in successful operation for over a year, embodies features which distinguish it from all other steam-turbine stations of the South and which contribute greatly to the economical generation of electricity. Its design both within and without is pleasing to the eye, and means are provided for keeping a close check on operations from the coal pile to the outgoing lines with a view to getting maximum efficiency at every step in the manufacturing process. It is only necessary to note the change in the force required to operate the new station as compared with that employed in the old Indian Street station to get a comprehension of the economies effected. The Indian Street station contained eleven water-tube and return tubular boilers having an aggregate rating of 2850 hp. There were six engines rated at 3220 hp, two 1000-kw turbines and three railway generators rated at 1300 kw. Besides there was 850 kw of engine-driven and motor-driven Edison apparatus, the main generators in the station being either directly connected or belt-driven. To handle this equipment required three station engineers, one chief and one assistant chief engineer, six oilers, six switchboard attendants and electricians, ten coal passers, twenty firemen and seven men who did repair and other miscellaneous work. In the new station are one chief and one assistant chief engineer, one clerk, three shift engineers, three switchboard attendants, three stokers, three oilers, one machinist and three coal and ash men. To these should be added three attendants in the Bay Street substation. The old firemen were, moreover, negroes, whereas under the better conditions obtaining in the new station white firemen are employed, with very much better results.

Features which add greatly to the easy operation of

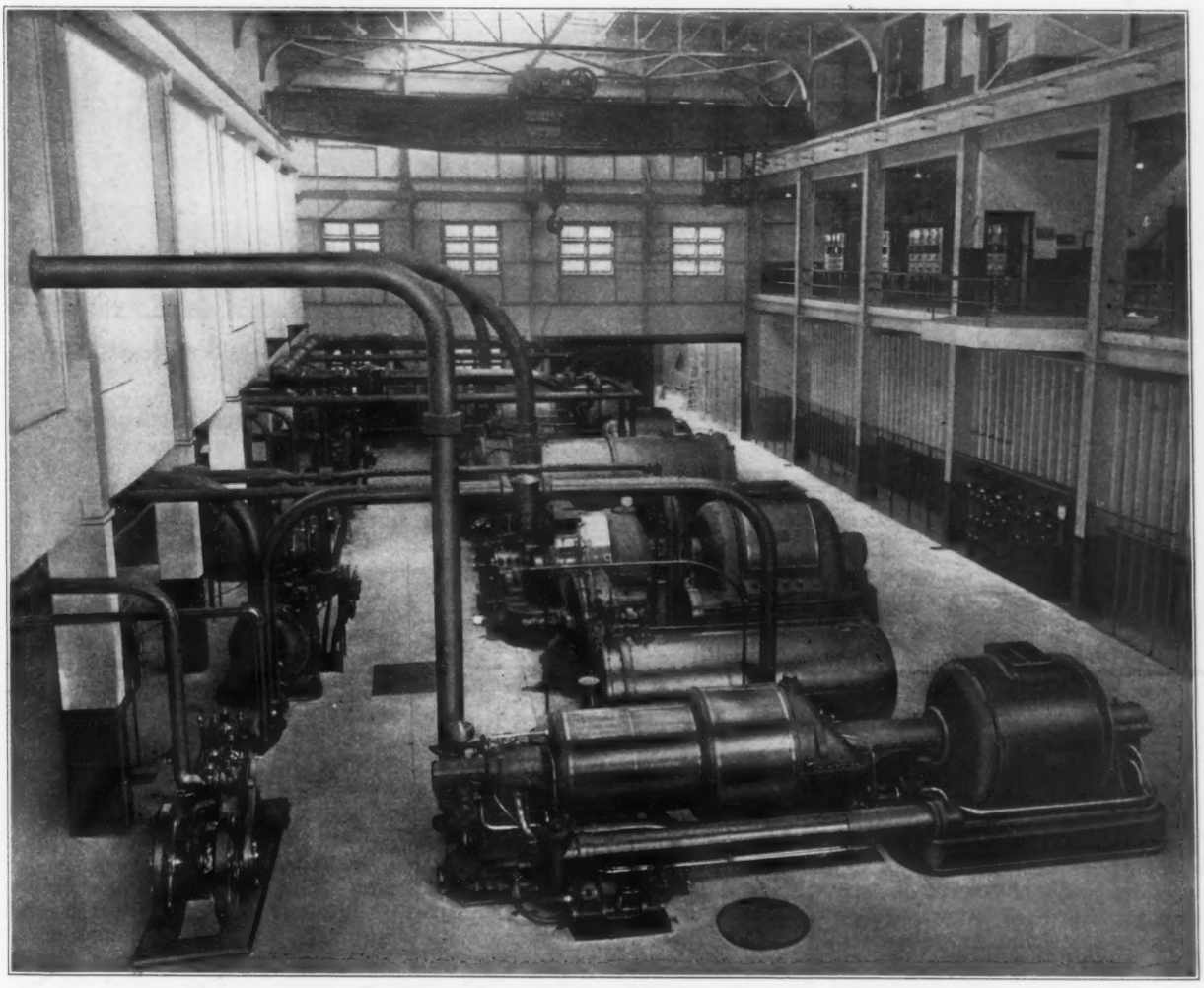


FIG. 1—RIVERSIDE GENERATING STATION OF THE SAVANNAH ELECTRIC COMPANY

the station and to its cleanly appearance are, first of all, an abundance of natural light. The condensers and all auxiliary units, including the boiler feed-water pumps, are on the same level and floor as the steam turbines; the boiler room is elevated above the turbine room, the tops of the boilers themselves being lagged and covered with a smooth cement walkway, and the

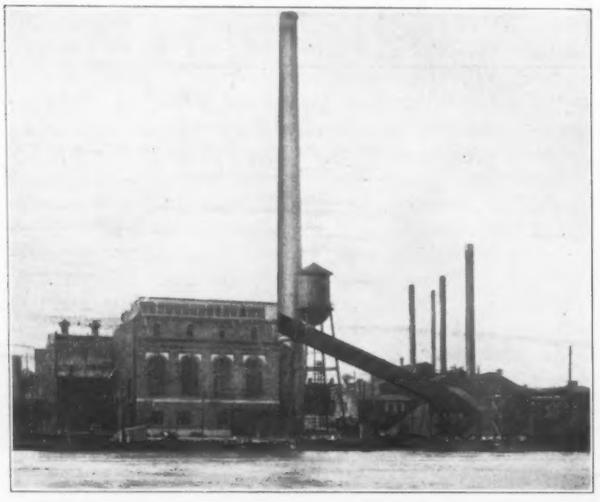


FIG. 2—RIVERSIDE STATION, SHOWING COALING FACILITIES

main steam header is arranged about 3 ft. above the floor at the rear of the boilers, where it is easy of access without climbing. There is a high and light basement beneath the boiler room through which a railroad spur track runs and on which ash cars enter the station and are loaded from a gravity ashpit, the ashes being used for filling-in purposes and for track ballast on the suburban electric railway lines of the company.

There are two electric-light plants operating in competition in Savannah, that of the Savannah Electric Company and that of the Savannah Lighting Company.

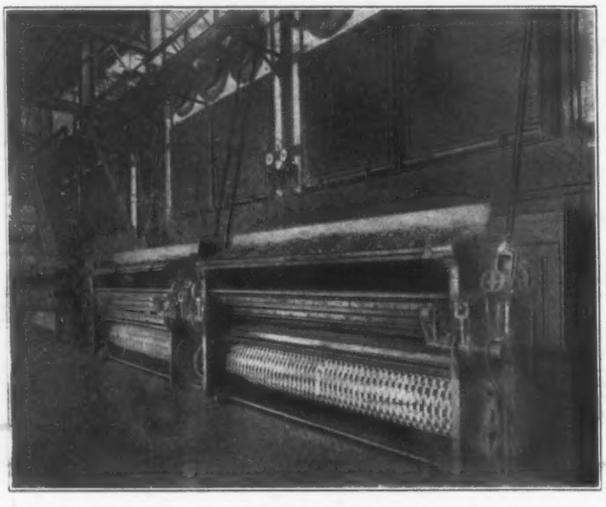


FIG. 3—BOILER ROOM OF RIVERSIDE STATION

The general manager of the former company, which also supplies electrical energy for the operation of the street railways of Savannah, is the Stone & Webster Management Association. The station of the latter company has equipment with a total rating of 4000 kw. For a while competition between the two companies was rather keen, but of late the Savannah Electric Company has greatly outdistanced its competitor.

The new station of the Savannah Electric Company is at the corner of River and West Broad Streets, on the Savannah River. The city is 18 miles from the sea, and the water of the river, although muddy and brackish, is suitable for condensing purposes and, after treatment, for feed water also. Coal is brought from Norfolk by boat or can be received by rail, and abundant storage facilities are provided on a plot adjoining the station. The station itself is a fireproof structure with steel framework and brick walls. Its general appearance is shown in one of the engravings, and a cross-sectional elevation shows the disposition of the apparatus within.

Boiler-Room Equipment

The boiler room contains four 665-hp Babcock & Wilcox water-tube boilers the furnaces for which are fitted with Green Engineering Company chain-grate stokers equipped with Foster superheaters. The type of stoker chosen will permit of using a cheaper grade of coal from the Alabama fields if desirable. Two Wachs engines are belt-connected to the stoker shafts, only one, however, being necessary to drive the present stoker installation. Provision has been made for ex-

FIG. 4—COAL-CONVEYING EQUIPMENT IN RIVERSIDE STATION

tending the station when necessary, a temporary wall being provided at one end of the station with that in view. The boiler breeching connects with a reinforced-concrete stack 10 ft. in diameter and 254 ft. high. As shown in Fig. 6, the tops of the boilers are covered in such a manner that a smooth walkway is provided and if necessary the space can be used advantageously for storage purposes. The boilers were first lagged with asbestos, over which was spread a pillow of cinder concrete. This was finished off with 2 in. of monolithic concrete. The maximum thickness of the covering is 2 ft. and the minimum thickness (over the drums) is 3 in. The arrangement not only serves to conserve the heat of the boilers but it also makes for cleanliness, for, as operating men well know, the top of boilers is about the most uninviting place in a power house. The simplicity of the piping above the boilers also contrasts greatly with that found in most boiler rooms.

Coal and Ash Handling Equipment

Coal is usually brought to the station in deep-sea barges and deposited on the storage lot across the road from the station. Suitable apparatus, comprising a crusher outfit, a Browning locomotive crane and a Robbins belt conveyor, is employed to deliver the coal to the hoppers over the boiler room. In its passage

from the storage pile to the bunkers the coal is weighed by an automatic weighing device. The bunker directly over the firing aisle in the boiler room has a storage capacity of 300 tons, sufficient for about five days' supply. A chute on which is installed an automatic weighing machine travels on a track beneath the bunker and delivers coal from the bunkers to the hoppers of the stokers. In this way a record can be made of the coal used per shift or per diem and a check obtained on the conveyor scales. The coal crusher is driven by a 25-hp motor and the conveyor by a 7.5-hp motor. Steam-flow meters form part of the instrument equipment of each boiler. As indicated in the cross-sectional elevation of the station, the ashes drop from the stoker into an ash hopper, whence they are taken away in cars.

Feed-Water and Condensing Equipment

Water for boiler purposes is taken from the Savannah River through the intake tunnels and pumped thence to a concrete sedimentation tank 27 ft. by 27 ft. and 10 ft. deep. In addition, there is a 50,000-gal. tank 80 ft. above ground. The water is treated with an alum coagulant. An Organ feed-water heater built by the Exeter Machine Works, of Pittston, Pa., and

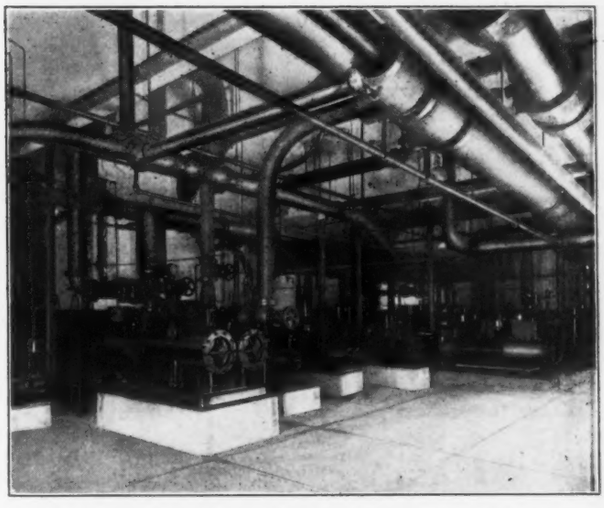


FIG. 5—FEED-WATER PUMP EQUIPMENT IN TURBINE ROOM

rated at 5000 hp, is also installed to raise the feed water to 210 deg. The steam for the heater is taken from the auxiliaries, which are installed on the turbine-room floor, in a bay under the boilers. There are two duplex and one turbine-driven centrifugal feed-water pumps installed, in addition to an Underwriters' fire pump, a low-service pump and a centrifugal pump for pumping water to the elevated tank. The latter is driven by a 15-hp, two-phase, 220-volt induction motor.

The condensers are of the Worthington surface type and are installed beside the turbines. The condensers for the two large turbines have a cooling surface of 13,000 sq. ft., and that for the small turbine 4000 sq. ft. Circulating water is taken from the river and supplied to the condensing units by steam-engine-driven volute pumps. The hot-well pumps are of the vertical Worthington type driven by Terry steam turbines. The dry-vacuum pumps are of the horizontal rotative type.

There are pipe and air tunnels running the length of the turbine room. The former contains all the exhaust, hot and cold well piping, atmospheric relief, etc. Under it are the condensing water intake and discharge tunnels. The latter are built of brick and are 5.5 ft. inside diameter. Horizontal screens protect the intake, and a diverting bulkhead directs the discharged water away and down stream from the intake. The screens are installed in duplicate to permit of raising and cleaning one while the other is in service. The turbine room is spanned by a 45-ton Case crane.

Main Generating Units

The generating equipment at present installed consists of two 5000-kw General Electric horizontal turbo-

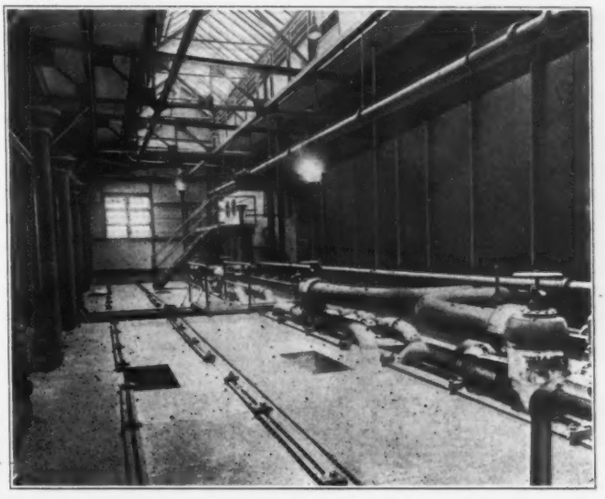


FIG. 6—VIEW OF BOILER TOPS, SAVANNAH ELECTRIC COMPANY

generators and one 1000-kw Allis-Chalmers unit moved from the Indian Street station. The generators are two-phase, 2300-volt, sixty-cycle machines. Steam is taken from the boilers through 6-in. feeders to a 12-in. header mounted slightly above the floor in the rear of the boilers. Long radius 8-in. and 6-in. pipes pass from the header through the wall to the turbines. The steam pressure is 180 lb. Excitation energy is supplied to the main generators by two 125-kw General Electric turbine-driven exciter units.

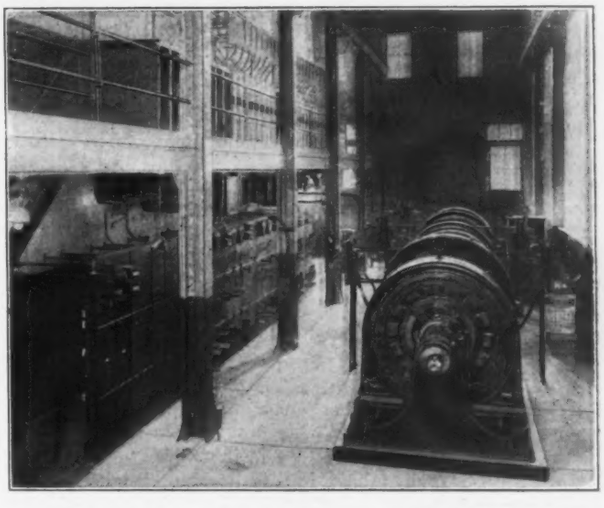


FIG. 7—BAY STREET SUBSTATION, SAVANNAH ELECTRIC COMPANY

In the turbine room is also installed a 1000-kw motor-generator set for railway load. The generator is a 600-volt machine and the motor is a 2300-volt synchronous type. Space is provided for three more sets of the same type. Future plans also contemplate the installation of two 7500-kw and two 10,000-kw, three-phase, sixty-cycle, 13,200-volt turbo-generators.

The switchboard gallery extends along the south side of the turbine room some 18 ft. above the floor. The machine board is of the benchboard type, and from it the entire turbine room can be seen. The station lamps and motors are controlled from a switchboard on the turbine-room floor. There is nothing unusual about the switchboard equipment, which follows standard General Electric practice.

To the left of the switchboard room are fifteen fifty-light mercury rectifier sets. These are equipped with a mechanical water-cooling outfit for cooling the oil in the tube tanks. A closed system for circulating the water for the rectifiers is used. Compressed air from a Westinghouse compressor is first cooled with ordinary river water by coming in contact with water tubes. It is then expanded in a large tank into which water trickles through a perforated baffle plate. This water is used in the rectifier tube tanks.

Under the switchboard gallery are installed the switch cells and bus compartments. To the west of this section is a fireproof room containing the transformers for the station load and the compensators for starting the motor-generator set. In the gallery above the main switchboard are the lightning arresters, rheostats and storage battery for operating the remote-control apparatus. A fireproof transformer house adjoins the station, in which are installed two 1250-kw, 13,200-volt water-cooled transformers feeding a line to the Mill Haven factory district where a step-down distributing transformer house is installed.

The Bay Street substation is equipped with three motor-generator sets, rated at 750 kw, 500 kw and 300 kw respectively, for the underground direct-current three-wire system in the business district of Savannah. There is room for a 4000-kw machine, and the smaller machine can be displaced by 1000-kw machines if necessary. There are two feeder lines conecting the Riverside station with the Bay Street substation. The latter supplies at present twelve outgoing three-wire feeders. The station was designed and built by the Stone & Webster Engineering Corporation, of Boston, Mass.

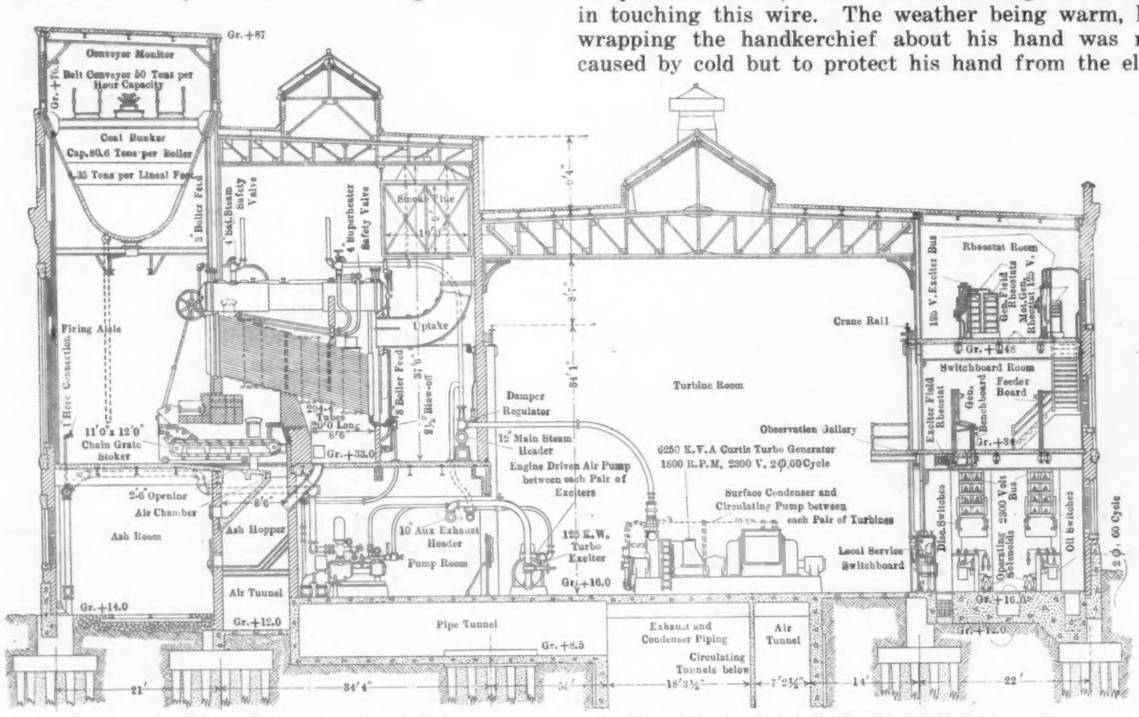


FIG. 8—CROSS-SECTIONAL ELEVATION OF RIVERSIDE STATION OF SAVANNH ELECTRIC COMPANY

Grasping Suspended Wire Held to Be Contributory Negligence

In a recent decision handed down by the Appellate Division, Supreme Court, Second Department, New York (145 N. Y. S., 981), it was held that a man who had seen a horse apparently killed by contact with a wire was guilty of contributory negligence in grasping the wire with his hand, wrapped in a handkerchief, even though the wire was not then sputtering or emitting flashes. In this case a horse attached to a vehicle had become entangled with a fallen wire, and the man while endeavoring to get the animal clear had seen the effect of the contact upon it. After the wire had been disconnected part of it hung some 3 ft. or 4 ft. behind the vehicle. The man took hold of this wire and as he approached the sidewalk, walking backward, received a fatal shock. In his hand grasping the wire was found a cotton handkerchief partly burned. The court held that, as the dangerous current was shown by the prostrate horse, the man had knowledge of his risk in touching this wire. The weather being warm, his wrapping the handkerchief about his hand was not caused by cold but to protect his hand from the electricity. As the man must have realized his danger, his grasping the live wire with no protection but a handkerchief was a plain disregard of common care and caution. Hence, even if the wire was not then sputtering or emitting flashes, he was guilty of contributory negligence.

A Storage Battery's Adventure with a Wire Bed-Spring

A fire which might have been accompanied by disastrous results was recently caused in a curious way by wire bed-springs short-circuiting a storage battery which had been temporarily placed beneath the bed. The occupant of the bedroom in sitting on the bed caused the springs to sag, short-circuit the battery terminals, and fuse, thereby burning a hole in the mattress and setting fire to the bedding. The battery had been removed from an automobile and was being stored for the rest of the winter beneath the bed.

Color Effects for Advertising and the Stage

Use of varicolored light to bring out the striking and bizarre in advertising and stage displays—Application to flashing signs. By M. Luckiesh

THE appearance of colored objects depends largely upon the quality of the light which illuminates them. That is, the color of an object is not wholly inherent in the object itself. Things are visible only by virtue of the light which passes from them to the eye. For instance, a red fabric appears red only when red rays are present in the light which illuminates it. The fabric is designated as red because it has the property of reflecting only red light. Obviously, if red rays are not present in the light under which it is viewed it will appear black. The ghastly appearance of the human face in the light of the mercury-vapor lamp is a familiar example of the distortion of color produced by a light deficient in red rays. The difficulty in distinguishing dark-blue fabrics under many of the artificial illuminants arises from the scarcity of blue rays in those illuminants. To overcome the latter difficulty and others, artificial daylight* can be produced. The effects of the color of the illuminant upon the appearance of colored objects are found on every hand. In the matching of colored fabrics instances are found where a color match obtained under one illuminant will be unbalanced under another illuminant. The same is true of colors employed by artists. In fact, the appearance of colors in paintings when illuminated by artificial light is so different from that under daylight that it is highly desirable to correct the artificial light in order to give the pictures daylight appearance. This has already been done in the lighting of a large art exhibit† by mixing colored light with the ordinary tungsten light, treating each picture in such a manner as to give it a desired appearance. The specific treatment of each painting is also desirable from the standpoint of control of distribution and intensity of the light for each picture. The ease in controlling the quality of artificial light by injecting colored light proves a ready means of giving to valuable paintings their desired appearance. Even the ravages of time upon pigments and other limitations can be overcome, and dimmed, old canvases can be freshened into luminous masterpieces.

The applied science of color can be carried further and new applications to stage effects, displays and advertising signs can be produced. In doing this it must be borne in mind that any color can be defined by three factors, hue, saturation and luminosity. For the purpose of producing disappearing effects even a simpler analysis can be made. That is, it is only necessary to consider the color of the light which a pigment reflects quite apart from the amount of light that it reflects. The first involves hue and saturation, while the reflecting power of the pigment determines its luminosity or brightness, which in the artist's terminology is defined as value. A group of colored patches can be made to disappear—that is, to become indistinguishable from each other when they are illuminated by light of such a color that they reflect rays of exactly the same character and in equal amounts. This condition will not hold in general for other illuminants; therefore, some of the colored patches at least will be distinguishable under another illuminant. The success of the experiment, of course, involves the choice of pigments properly related to each other and to the colored lights to be employed. Pure, luminous pigments are highly preferable to the ordinary oil paints. It is practically impossible to describe accurately in words any single experiment owing to the undeveloped and unsatisfactory state of color notation. The effects described in this article involve merely the science of color and can be readily produced.

The modern tendencies toward the use of color and color effects point to great future possibilities in the application of the science of color. Already in some European theaters the stage scenery is being revolutionized and lighting effects are playing an even greater

*"The Subtractive Production of Artificial Daylight," *Electrical World*, May 4, 1911.

†"Lighting of the Cleveland Art-Loan Exposition," *Electrical World*, Dec. 27, 1913.

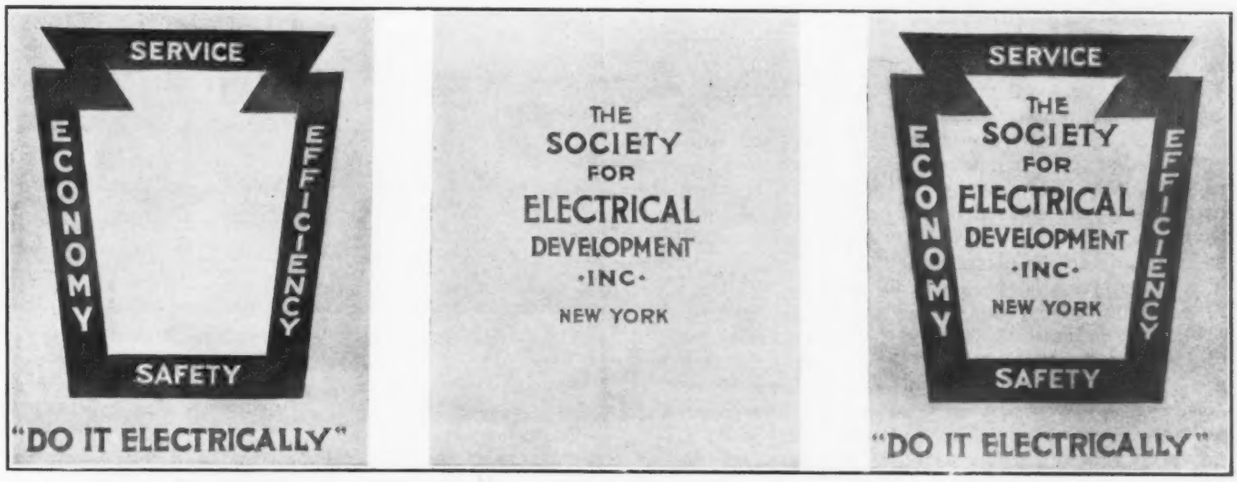


FIG. 1—DISAPPEARING AND CHANGING EFFECTS PRODUCED IN SIGN BY MEANS OF VARICOLORED LIGHT

part in the drama than heretofore. The writer's experiments suggest the possibility that rays of light, swift and noiseless, might take the place of some of the present-day cumbersome methods of scene-shifting. Possibilities are also suggested for representing the supernatural heretofore unrealized. In Fig. 3 are shown, as well as can be illustrated in black and white, several

FIG. 2—MOUNTAIN PEAK MADE TO DISAPPEAR OR APPEAR BY MEANS OF VARIATION OF COLORED LIGHT

appearances of a specially designed painting illuminated by colored lights. The first view shows nothing but a Japanesque group of branches. By varying the quality of the light falling upon the painting a figure is made gradually to appear, undergoing various transformations in its evolution, as will be noted, for instance, by the appearance of the flowing robe. Unfortunately the illustrations reproduced in black and white are robbed of all the beauty of color, but the possibilities of such a scheme can be readily imagined. A stage scene can be operated in the same manner. For the painting just mentioned only red and clear tungsten lamps were used to produce the appearance and disappearance of the figure. Various other colored lights, of course, multiply the changes that are possible. The colors used in the figure and background of this painting are so related in regard to their characteristics of reflection that under one lighting the background is perfectly uniform, the figure having disappeared, and the picture appears to be a Japanesque group of branches. Various physiological and psychological phenomena also work toward the success of the scheme. For instance, in many cases even when the color of the light falling upon a painted scene is very saturated or pure it appears to be very unsaturated. This, of course, is due to the absence of any other color which might furnish contrast. This phenomena is desirable because it softens the effect. The colors involved in the picture illustrated in Fig. 3 are white, gray, purple, green, yellow, orange, red and several intermediate ones. It is thus seen that elaborate effects are possible with only two differently colored illuminants.

In Fig. 2 is represented a mountain peak which is made to disappear or appear at will by means of colored rays of light. Here, again, the effect is obtained by the use of only one colored light besides that of the clear tungsten lamp, although the use of other colored lights adds greatly to the attractiveness of the effects. Lightning effects can be produced by flashing light that is reflected only from the proper place. Of course, this selectivity is readily obtained by placing the proper pigment in the right place. Non-uniform distribution of light across the scene also has striking effects.

In Fig. 1 is represented a possibility outrivaling the ordinary illuminated sign, for actual disappearing and changing effects are produced. The copy shown in the second view is in black and designed to be permanent, while that shown in the first view appears and disappears. The complete sign is shown in the third view. The flashing of a portion of the sign is very effective and compels attention. This is a very simple sign requiring a most simple wiring scheme. The flashing lettered sign can be effectively combined with a scenic painting. Practically an endless variety of effects can be produced with the additional advantage that the copy can be changed as rapidly as desired.

This scheme has already been applied to displays. Even the haphazard play of colored lights upon colored patterns not designedly chosen is productive of catchy attractiveness. However, the actual disappearing effects are more desirable. For window displays the copy is placed in a darkened recess and protected as much as possible from extraneous light. The colored lights are operated by flashers designed to bring about the proper sequence of appearances. For outdoor displays the sign must be placed in such position that the plans of the designer are not disturbed by light from other sources. Of course, where colored light is necessary in illuminating signs, as in this scheme, considerable electrical power is necessary. This scheme has not been placed in practice on large out-door signs, but calculations show that the power required is not prohibitive. High-efficiency tungsten lamps in large sizes are especially applicable here. These can be combined with colored glasses and motor-driven flashers to produce effective displays.

Several advantages are found in the scheme illustrated here. Apparent motion is obtained without elaborate wiring or mechanical devices except the usual flasher. Copy can be changed continually if desired, or the sign can be repainted often. The only expense involved in the change of copy is in the painting of it, for the color scheme can always be retained in proper relationship to the colored lights. The effects are obtained more simply by reflection than by transmission as in the ordinary transparent sign. A flashing sign of this character is very simple and the possibilities of scenic effects are greater than in any other method, simplicity being taken into consideration. The scheme adds to the possibilities of stage effects where it can be carried out with ease and sometimes employed to supplant the jarring interruption due to shifting scenery. Of course, the necessity of screening extraneous light if present will be a disadvantage in the application of this

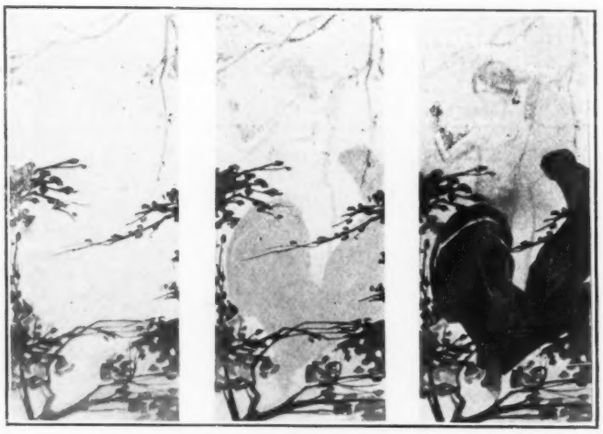


FIG. 3—DISAPPEARANCE OF FIGURE IN VARIED LIGHT

scheme. There are, however, many conditions where this is unnecessary.

Colored light has made its début. Its use in interior illumination, displays, advertising and stage effects presents great possibilities and the long-sought color symphony may be realized in this age.

Classification and Characterization of Molded Insulations—I

Grouping based on predominating constituents electrical and mechanical — Properties of various types of insulation and method of manufacture. By Emile Hemming

THE progress made in the construction of electrical machinery and appliances has created a wide demand for molded insulations. As these newer materials are rapidly coming into extensive use, it is important that they be properly classified and their characteristics understood by electrical engineers and designers.

Molded insulations may be broadly grouped as follows:

Class A—Organic Hot-Molded Materials. Obtained by mechanically mixing natural organic binders in the plastic state with organic or inorganic fillers, molding the mixtures in heated dies, cooling and removing the pieces from the molds in a finished condition.

Class B—Organic Cold-Molded Materials. Obtained by mixing organic binders in a dissolved condition with organic or inorganic fillers, molding in a cold state and hardening after removal from the dies.

Class C—Inorganic Cold-Molded Materials. Obtained by mixing inorganic binders, chiefly with inorganic fillers, molding in a cold state and solidifying after removal from the dies.

Class D—Ceramics. Known generally under the name of porcelain—made from a mixture of china-clay, silica and water, molded in a cold state and heated to a fusing point after removal from the dies.

Class E—Rubber Compounds. Mixtures of gutta percha; generally adulterated with asphalts, oils and other substitutes, mixed with inorganic fillers and vulcanized.

Class F—Organic Plastics. Made from organic substances chemically treated to render them plastic and molded into the desired forms. This class embraces a wide range.

Class G—Synthetic Resinous Products. Obtained by mixing synthetic organic binders with organic or inorganic fillers and molding the mixtures in heated dies.

Class H—Hardened Fiber Materials. Made from paper treated to render it extremely hard. The molding of this class of material is practically limited to the production of sheet, rods and tubes.

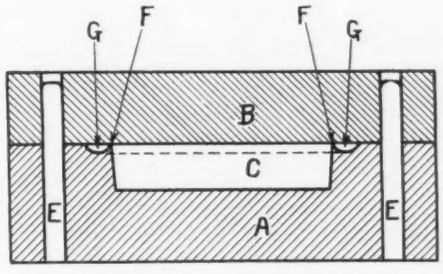


FIG. 1—TWO-PART OPEN DIE FOR TAPERED WORK

Class I—Molded Mica. Flakes or laminas of mica cemented together with resinous binders.

Hot-molded organic insulations consist of binders like shellac, damar gum, rosin, asphalt or pitch combined with fillers, such as wood pulp, cotton waste, finely ground mineral materials and asbestos. Sometimes metallic or earth pigments, lampblack or organic dye stuffs are included for coloring.

Two methods are commonly employed to combine these materials. One is to melt the organic binders, mix in the fillers and then roll the mass into sheets while it is in a hot plastic condition. The sheets are then

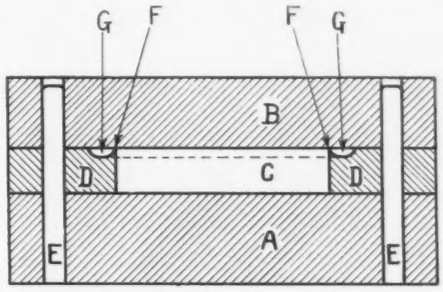


FIG. 2—THREE-PART OPEN DIE FOR CLASS A, E, F AND G INSULATIONS

broken, softened on steam tables and placed in heated open dies, which are pressed and cooled, and the product is removed in the finished condition. The second method of manufacture is to dissolve the binders in proper solvents and mix with the filler with or without the application of heat. On exposure to the air the solvent evaporates, leaving an intimate, uniform mixture which is afterward ground into a powder. The pulverized material is placed under pressure in heated closed dies until melted, when it is allowed to cool, leaving the finished product.

Insulations produced by either method have about the same properties, but more filling material may be incorporated by employing the second method. The higher the proportion of binding material and the more finely divided the filler, the more plastic will be the mix and the cleaner will be the appearance of the finished piece. On the other hand, a higher percentage of filler (especially when inorganic) will produce a less plastic mix and a less attractive finish. It will not be as subject to the softening influence of heat, however. If the binder is entirely free of rosin and cheap gums, this class of insulation will be very stable. Rosin, because of its low cost and adaptability to molding, however, is being often used as a binder in Class A insulation, but it causes the compound to deteriorate rapidly under climatic exposure.

Bitumens or asphalts melt very easily, hence insulations containing them as binders do not withstand high temperatures. Even the sun's rays have been known to soften products containing these materials. Class A insulation is practically non-hygroscopic, unless it contains an excess of a filler like asbestos fiber. Even then it may be used to insulate ordinary voltages under normal weather conditions unless rosin is contained in the insulation. Organic hot-molded insulation will soften at about 80 deg. C. if the binder is shellac and at a lower temperature with a rosin content. It has been found that the higher the percentage of organic binder the

better will be the insulating properties, while the opposite is true if the filler predominates in quantity. The dielectric strength and density are improved by using an intimate mixture of the constituents and subjecting them to an extremely high pressure and proper heat when molding.

These conditions of dielectric, water-proof and heat-proof qualities, due to variations in the percentage of fillers and binders, also apply to the insulating products of Classes B, E and G.

Cold-molded organic insulation is similar in finished appearance to the Class A type. The binders ordinarily used in the cold-molded product are the asphalts, while the fillers are asbestos, silica or other mineral substance. The binder is dissolved and mixed with the filler in a cold condition. The resulting semi-plastic mass is molded in cold dies and the contents are allowed to dry after removal, leaving a hard, durable substance. Because of the method of manufacturing, these molded articles cannot be made as accurate in dimensions as those of Class A. The shrinkage, however, due to the drying or heating is only about one-eighth that of ceramic products, such as porcelain. Heat and moisture have practically no effect on Class B insulations. The binder is the important part in this insulation, as it performs the function of waterproofing and cementing the material.

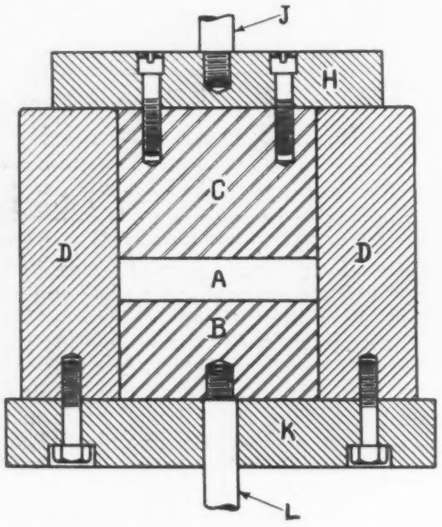


FIG. 3—COLD MOLD FOR USE WITH CLASS B, C AND D INSULATIONS

The cold-molded inorganic insulations contain asbestos, silica, alumina, lime, magnesia and hydraulic cement. The mixture is made with the aid of water, which is later removed during molding by heavy pressure. Owing to the inorganic properties of both binders and fillers, insulation of this class is unaffected by the electric arc and after special treatment is rendered non-absorbent to moisture. This insulation possesses the peculiar advantage of improving with age.

Ceramic products, of which porcelain, lavite, glass, etc., are the most important, are the least susceptible to chemical action of all molded insulations. Hard porcelain contains a large percentage of china-clay mixed with feldspar or other flux and sometimes with gypsum, chalk, etc. The quality of the clay is of first importance, for on it depends the plasticity of the mix, the ability to mold properly, the final hardness, strength and heat resistivity. It is important that the ingredients be finely divided and that the clay be free from impurities. In some manufacturing plants the plastic mix is molded directly in dies, while in others it is dried, reground, moistened and molded. Owing to the considerable shrinkage of porcelain during firing, the behavior of various shapes in the kilns should be studied.

Lava composition, another ceramic product, consists of powdered soapstone mixed with a solution of sodium silicate which is afterward dried, powdered, moistened and molded in dies under pressure. The molded articles are fired at a high temperature and after cooling are treated with the alkaline silicate solution and fired again. The operation is repeated until absorption of the silicate ceases. The finished products are very hard and tough and somewhat similar to porcelain. They resist sudden changes in heat better and for some insulating purposes are more desirable than porcelain. Shrinkage is the principal objection to lava composition insulation.

In the second instalment will be included several tables and illustrations of articles made of molded insulation. The data will give results of tests on the ohmic resistance and dielectric and tensile strengths of the various classes of insulation. Each class will also be characterized and a table given of the different varieties of molded articles with the class of insulation best adapted to their manufacture indicated.

Lighting and Electrically Driven Refrigerating Equipment of a Large Indoor Ice-Skating Rink

The increasing popular interest in indoor ice skating has resulted in the construction of rinks in many cities of North America. In Canada hockey is played extensively in such rinks by professional teams, and as the games occur at night proper lighting becomes an important requirement. Considerable interest, therefore, attaches to the lighting installation of the Arena Ice Rink at Vancouver, B. C., the refrigerating and pumping equipment of which is also electrically operated. Electrical service has in this case been supplied long enough to afford an accurate estimate of the energy consumption and the resultant load-factors.

The main ice sheet measures 85 ft. wide by 210 ft. long and is surrounded by three tiers of seats. The only supports which could be used for the main-floor lighting system were the roof trusses, 60 ft. above the ice. It was therefore decided to use 100-watt clear tungsten lamps with Holophane concentrating reflectors set in sockets about 5 ft. apart on the lower chords of the roof trusses. The trusses are 14 ft. apart so this arrangement places one lamp for every 75 sq. ft. of roof area. The entire system comprises sixteen rows of twenty-two lamps each, making a total of 352 100-watt units. The circuits are so arranged that alternate lamps in each row can be turned off separately, and the conduits are run along the under side of the bottom chords to the mains on the south side of the building.

A secondary lighting system which can be used to give a very pleasing "moonlight effect" consists of 234 25-watt tungsten lamps placed at 2-ft. intervals under the first-balcony girders and entirely surrounding the ice area. These lamps are colored a light blue and have no reflectors.

Lighting service in other parts of the building, including the locker rooms, engine room, curling alleys, etc., requires a total of 323 60-watt lamps, 153 100-watt lamps, thirty-eight 40-watt lamps, and eight 250-watt lamps, besides four arc lamps. That portion of this lighting equipment used under ordinary conditions constitutes a 66-kw load.

Refrigerating Equipment

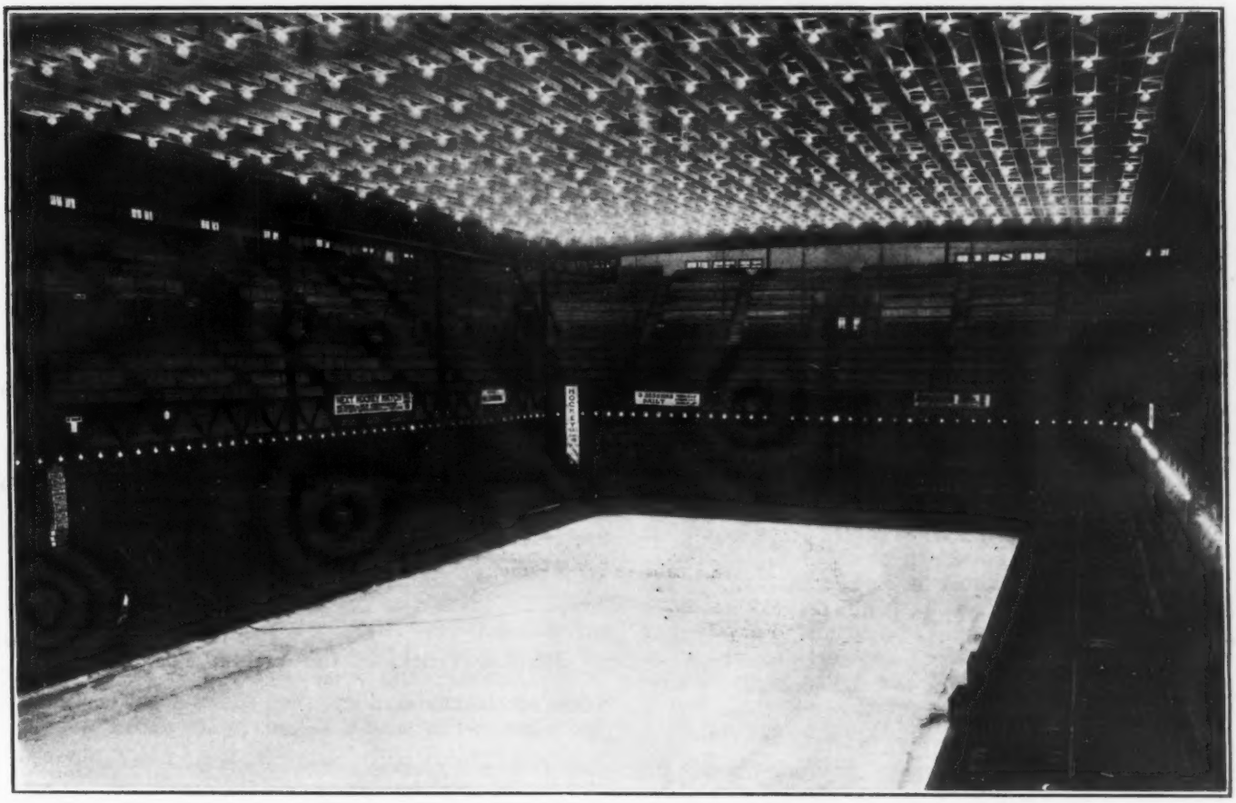
The total ice area on the main floor and the four 14-ft. by 130-ft. curling alleys is 15,130 sq. ft. To maintain effectively the refrigeration of this area an equipment was installed capable of making 50 tons to 55 tons of ice per twenty-four hours, and rated at "115 tons of refrigeration" per twenty-four hours. The Vilter compressor units are installed in duplicate. Each has 14-in. by 28-in. cylinders and operates at 76 r.p.m. The motors run at 360 r.p.m. and drive the machines through 1-in. manila ropes connecting with the 18-ft. flywheels. These ropes, which have no metal cores and which are maintained at a constant tension of 150 lb. by a jockey-type tightener, have been in service for three years without any repairs whatever.

The brine system begins at the centrifugal pump in the basement, which delivers the brine to the 8-ft. by 85-ft. by 8-ft. cooling tank on the third floor. From this tank a 10-in. siphon discharge is led downward to a header just below the end of the ice floor, and from here about 250 1.25-in. pipes lead out across the length of the ice area and discharge into an open flume below floor level. This flume runs the length of the building, returning the brine to its starting point in an open wooden tank close to the centrifugal pump. The curling alleys are supplied in a similar manner by a branch of the same header, and the brine is returned in a gravity trough to the same open tank for re-pumping. The length of 1.25-in. piping in the main floor and curling alleys totals about 13 miles.

Three distinct pumping systems are therefore involved, one for the brine, a second for ammonia, and a third to supply the water from the bay which serves the condenser. The last-mentioned utilizes a Gould 3-in. centrifugal pump operated by a 25-hp motor against a variable suction and a constant 35-ft. head. The 10-in. centrifugal pump in the brine system is belt-connected to a 75-hp motor. This large motor was installed partly because six 90-deg. elbows were required in the 10-in. pipe between the pump and discharge. Each of the Vilter pumps is operated by a 125-hp, 2300-volt General Electric motor, one of these being set on either side of the switchboard which is the central point of control for all the motor units.

All four motors are installed in the basement and are fed through underground conduits from a completely inclosed concrete transformer room. This room can be reached only through a door opening on the outside of the building to which only the electric company has access. Energy enters this room over the 2200-volt, three-phase primary service lines of the company, and is here stepped down to 220/110-volts.

During the skating season this 350 hp in motor equipment operates at a load-factor of 25 per cent, which becomes 12 per cent when distributed over a full year. While this is much better than the annual load-factor for the lighting—about 3 per cent—it should be borne in mind that the skating season runs from October to March, during which time the electric company has to meet its maximum peak load. In this instance, however, rink patrons come and go on the street cars also operated by the same company. Although the rate charged for electrical energy should make it desirable to use the rink equipment during the summer months for the manufacture of ice, the plant has thus far remained closed except during the skating season.



INTERIOR VIEW ARENA ICE-SKATING RINK, VANCOUVER, B. C.

The Arena Ice Rink was built for the Vancouver Arena Company, Ltd., of which Mr. Frank Patrick is managing director. The structure cost about $225,000 and the plant and equipment about $25,000. Mr. K. A. Auty, chief illuminating and motor-service engineer for the British Columbia Electric Railway Company, designed the lighting system and supervised its installation.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

A New-Business Record at St Joseph, Mo.

The six-month period from July 1 to Dec. 31, 1913, marked an era of unusual growth for the St. Joseph (Mo.) Railway, Light, Heat & Power Company. During that time the new-business department secured contracts for more than 1600 hp in motor load among industries which formerly operated steam and gasoline engines. Among the residence patrons 1400 electric flatirons, 250 vacuum cleaners and 19 electric ranges were sold. Street lighting of any other type than electric may almost be said to have become unpopular, and in consequence 175 gas lamps have been taken out and replaced by electric standards. In addition, ten blocks of new "white way" lighting have been placed in operation.

Calculating the Size of a Refrigerating Outfit

By Sydney F. Walker

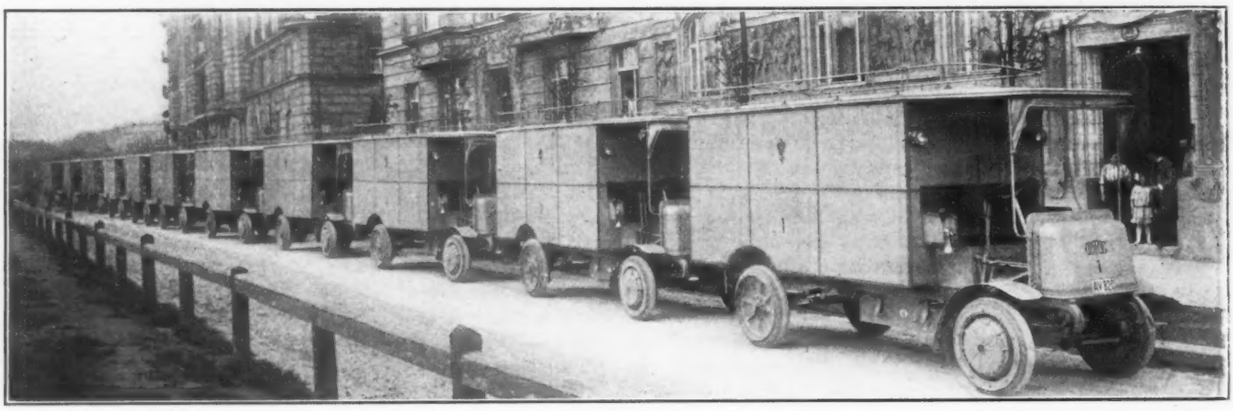
In calculating the power required for a given refrigerating plant, an estimate should first be made of the quantity of heat to be abstracted. When, for instance, meat has to be frozen, its latent heat must not be overlooked. In addition, what is termed the animal heat has to be taken out, or allowed to pass off, and the temperature of the meat has then to be lowered to the latter's freezing point, which again is below that of water. Where meat has only to be chilled it is but a question of lowering the temperature from that after the animal heat has passed off to about 34 deg. Fahr., and this may be calculated by its specific heat, weight and the number of degrees through which it has to be cooled. The same reasoning also applies to any kind of produce to be cooled. Where meat has to be frozen, the weight and the latent heat per pound multiplied together give the additional heat to be abstracted over and above that for chilling. In calculating the power required to hold a cold-storage room at a given temperature it is usual to take for calculation a standard rate of 2 lb.-Fahr. heat units per hour per square foot of area of the walls, floor and ceiling, per degree difference of temperature between the outside and the inside. Thus, if the temperature is 90 deg. Fahr. on the outside, and the air on the inside is to be held at 30 deg. Fahr., and there is a total surface of 1000 sq. ft., about 120,000 lb.-Fahr. heat units will have to be abstracted per hour. This means the use of about a 10-ton machine, requiring from 10 hp to 15 hp, according to the temperature of the cooling water available for the condenser.

Activity in Louisville

Under the direction of Mr. E. L. Callahan the reorganized commercial department of the Louisville Gas & Electric Company secured contracts for 6467 hp of new electrical business during the six months ended Feb. 1, 1914. The new lighting business contracted for amounted to 3034 hp, and the additional motor business to 3433 hp. The number of new electrical customers secured was 2159. Of the total new business, 1833 hp will replace isolated plants. As the result of a house-wiring campaign begun in December the commercial department has closed contracts for the wiring of about 350 dwellings. This campaign has also resulted in inducing independent electrical contractors to make special efforts to secure the wiring of old houses. The efforts of the contractors have been at least as successful as those of the lighting company. The gas department of the company has also been active. Natural gas from the West Virginia fields was turned into the Louisville mains on March 14.

Electric Trucks of the Vienna Post Office

The accompanying illustration shows about one-third of the fleet of thirty 2.5-ton Daimler electric trucks used by the Austrian post office department for carrying mail matter in the city of Vienna. The trucks are owned by a local omnibus firm and are rented to the government on the basis of a fixed mileage charge. The first of these



ELECTRIC TRUCKS OF THE VIENNA POST OFFICE

electric trucks entered the Vienna post office service about two years ago, and during the following twelve months this one car was driven over 10,000 miles. Comparative study of the haulage costs with gasoline trucks and animal traction have shown that these Vienna electric vehicles effect a saving of about 20 per cent in operating cost, in addition to their self-evident advantages of safety, cleanliness, simplicity, noiselessness and absence of odor.

"Safety First" Reminders in Pay Envelopes

In line with the "safety first" movement which is sweeping the country, the United Electric Light & Power Company, New York, has recently adopted the practice of inclosing in its employees' weekly pay envelopes printed suggestions warning against forms of

No. 6.

COMPANY RULES

SAFETY FIRST **TAKE NO CHANCES**

DON'T MAKE REPAIRS, OR ATTEMPT TO MAKE ADJUSTMENTS TO MOVING MACHINERY

DON'T go near high tension electrical apparatus unless it is your duty

DON'T go into coal bunkers or hoppers without life belt and life line with attendant holding same.

DON'T stand within swing of tools in hands of other workmen, nor in front of rivets, nuts, bolts or chips being chiseled off.

DON'T touch open wounds or burns, nor attempt to remove dirt or apply unclean dressing of any kind, as infection (blood poison) may result.

SAFETY—IT PAYS TO THINK BEFORE YOU ACT.

"SAFETY FIRST" SLIP FOR INSERTING IN PAY ENVELOPE

carelessness which may cause accidents. The company has a series of twelve of these slips, similar to the one shown herewith. A slip will be placed in each employee's envelope only once a month, as the company believes that such practice will bring better results than if inclosures were made at shorter intervals. They are printed in different colors and each presents five suggestions for preventing accidents. One reminder, reading "Don't make repairs or attempt to make adjustments on moving machinery," is printed on all of them in bold-faced type to attract special attention.

Among the suggestions appearing on these slips are the following:

"Don't use unsafe ladders or ladders not fastened, held or provided with proper safety attachments."

"Replace all guards and safety devices when through making repairs and before starting machinery."

"It is your duty to report unsafe conditions to your foreman or superintendent."

"Warn a man when danger is near. He may know all about it; if so, no harm is done; if not, you may prevent accident."

"Don't drink intoxicating liquors while on duty."

"Don't go into dangerous places until you are absolutely sure they are safeguarded; also prevent anyone from going until this is shown to be a fact."

"Don't rely on someone else to protect you; do it yourself."

"Don't disregard warning signs and notices."

"Don't leave tools, rubbish, etc., where someone can stumble over them."

"Don't walk into dark places you do not know well; get a light."

"Don't pile bricks or other material so that it will fall over easily."

"Don't do what you know you shouldn't."

"Don't go into coal bunkers or hoppers without life belt and life line with attendant holding same."

"Don't stand within swing of tools in hands of other workmen nor in front of rivets, nuts, bolts or chips being chiseled off."

"Don't handle hot babbitt, solder or lead without using goggles."

"Don't use tools in bad condition."

"Don't handle dangling wires unless it is your special business and you understand what you are doing. If absolutely necessary, use two dry sticks or boards."

"Don't have on loose clothing or gloves around moving machinery."

"Don't carry material up ladders; use both hands and pull material up with rope."

"Don't put dressing on moving belts unless it is done on the side of the belt leaving the nearest pulley."

"Don't touch open wounds or burns nor attempt to remove dirt or apply unclean dressing of any kind as infection (blood-poisoning) may result."

Across the bottom of each slip are such additional suggestions as "Read and heed: You are paid to comply with all company rules," "In case of doubt adopt a safe course," "Be sure before you do it," "It is the chance-takers who get hurt," "Safety—It pays to think before you act," "Don't gamble with chance. Play safe."

On the Assumption that the Customer Is Always Right

In the co-operative store of the Columbus Railway & Light Company salesmen are instructed that they must work on the assumption that the customer is right, first, last and always. A dissatisfied appliance customer returning a device and asking for a settlement is first reimbursed with the price of the appliance and later questioned as to the cause of its failure to operate satisfactorily. In this way the customers are taught that the company has faith in the goods it is selling, and immediately the faith of the consumer again returns, the result very often being that the money is returned to the company and a new appliance substituted, or the old one is repaired and returned to the customer's residence. Mr. W. A. Wolls, manager of the new-business

CO-OPERATIVE STORE OF COLUMBUS RAILWAY & LIGHT COMPANY

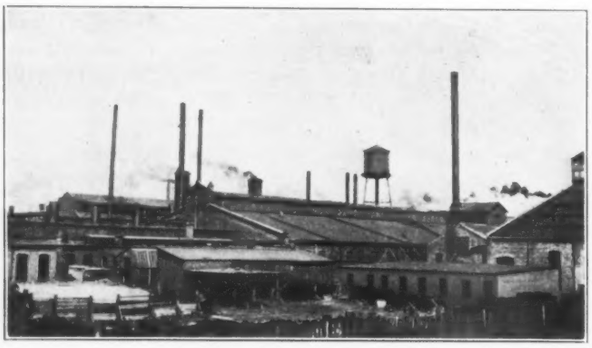
department, loses no opportunity to instil the "customer-be-pleased" spirit into the salesmen of the appliance department.

All electrical appliances handled in the co-operative store are purchased from the local dealers in the city, the company paying the dealers the cost price plus 10 per cent. These devices are then sold to the public at the retail price, in order that no hardship may be in-

flicted upon any of the local supply and appliance dealers. As will be noted from the accompanying illustration, there are no showcases in the co-operative store, all devices being displayed as tastily as possible out in the open where prospective customers may examine and operate them with the help of the woman demonstrator who is on duty during office hours.

Motor Drive in Malleable-Iron Foundry

Producing 25,000 tons of malleable-iron castings annually, the Missouri Malleable Iron Company, East St. Louis, Ill., ranks among the largest in its output of this



ELECTRICALLY OPERATED FOUNDRY AT EAST ST. LOUIS, ILL.

product, and especially notable is the fact that the plant takes energy from the mains of the local central-station company for its 370 hp in motor equipment. Three-phase Wagner induction motors with squirrel-cage

MOTOR APPLICATIONS

Number of Motors	Hp	R.p.m.	
5	10	1700	Directly connected to five No. 7 Buffalo blowers.
1	30	1140	Belted through jackshaft to slag mill 6 ft. long by 5 ft. in diameter.
1	10	1140	Belted to countershaft driving one small resin grinder, one sand mixer (6 ft. by 20 ft.) and one bucket conveyor (18 in. wide and 30 ft. long).
1	20	1140	Belted to line shaft driving one cut-off saw, one 18-in. rip saw, one "Dade" machine, one 18-in. drill press, one 12-in. lathe, one speed lathe, one wood-turning lathe and one 13-in. shaper.
1	50	1140	Belted to line shaft driving five batteries of ten tumbler mills each 4 ft. long and 2 ft. wide; also one No. 8 Buffalo blower.
1	20	1140	Belted to short line shaft driving one 1800-lb. drop-hammer, one 800-lb. drop-hammer and three 10-in. emery wheels.
1	50	1140	Belted to line shaft driving ten 26-in. emery wheels, ten 18-in. emery wheels and one No. 8 Buffalo blower.
1	50	1140	Belt-connected to eight tumbler mills 5 ft. long by 3 ft. in diameter.
1	50	1140	Belt-connected to 40 tumbler mills 4 ft. long by 2 ft. in diameter and one No. 8 Buffalo blower.
1	20	1140	Belted to line shaft in a machine shop driving two No. 5 National bolt cutters, one six-spindle 2-in. nut tapper, one 20-in. American shaper, two Lodge & Davis lathes, one 18-in. and one 26-in.; two planers, one 30-in. and one 24-in.; two 16-in. drill presses, one 30,000-lb. iron tester, one 26-in. drill press, one 45-ton hydraulic press, one grindstone 40 in. in diameter by 5 in. wide, one speed lathe and one two-spindle 0.5-in. bolt cutter.
1	10	1140	Belted to line shaft driving one 5-kw, 220-volt direct-current generator, one 26-in. drill press, one No. 2 Champion forge blower and one No. 30 Modern power hammer.
1	10	1140	Belted to one Buffalo heater.

windings have been used in all of the various applications, energy being supplied from the mains of the East St. Louis Light & Power Company.

Concerning the foundry company's product it may be pointed out that practically all of the castings are small and light in weight, necessitating the handling of a large number of pieces. The accompanying table of motor applications indicates the character of machinery used in making these castings ready for the market.

By grouping the machines the total connected load of the foundry, 370 hp, has been belted to sixteen motors. Records from these machines show that the average monthly energy consumption is 37,830 kw-hr. and that the average energy consumption per month per connected horse-power is 102.2 kw-hr. The maximum demand of the foundry is 155 kw, and the load-factor resulting has averaged 33.5 per cent.

Toledo's Electrical Residential Suburb

The value of having progressive realty companies co-operate with the local central station has already begun to be recognized in many communities, but a recent suburban development at Toledo, Ohio, points out a degree of electrical co-operation which bids fair to eclipse any achieved in the past. The Wiltsie Realty Company, operating in the suburb of Wildwood, twelve minutes' ride from Toledo's business center, is building there an exclusively electrical residence district. Twenty-six houses have so far been erected in this addition with the idea of having exclusive electric service prevail. Electric stoves, irons, toasters and percolators are being sold as part of the equipment of the houses. No gas or coal need be used in these residences, as electricity and hot water from the central-station service supply all the needs of the householders for lighting, cooking and heating purposes.

The houses are of the semi-bungalow type and are situated in a picturesquely wooded village, the streets of which are lighted by ornamental concrete lighting standards. Each house according to its size is wired with from twenty-four to thirty outlets on three separate circuits, the electric stove being wired on a circuit by itself. Energy is distributed over a three-wire system at 110 volts and 220 volts, and on account of the

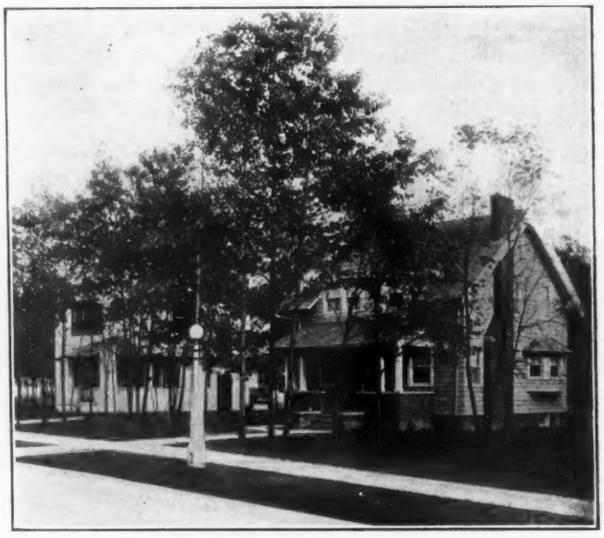


FIG. 1—HOMES IN WILDWOOD, ELECTRICAL SUBURB OF TOLEDO

relatively heavy demand of the stoves some of the heating elements are connected across the two sides of the circuit. It is interesting to note the relative sizes of the rooms of these houses. The living room is as a rule as large as 20 ft. by 36 ft., while the kitchen occupies a space of only 8 ft. by 10 ft. These miniature kitchens are furnished in white enamel, the effort hav-

ing been made to design the room so that the diminutive size will be a help rather than a detriment to the housewife. A woman demonstrator in the employ of the realty company aids new arrivals to the electric suburbs by teaching them the uses of the electric stove and applications of other appliances which will effect savings in the monthly electricity bill.

The stoves used in these houses were manufactured by the Copeman Electric Stove Company, of Flint, Mich., and are provided with compartments for boiling, baking and grilling. The maximum demand of the stove, 2.7 kw, is distributed as follows: a boiling compartment, 0.6 kw; baking compartment, 0.9 kw; grilling compartment, two units, 0.6 kw each. The stoves are equipped with an alarm-clock time switch for placing the heaters in operation at a predetermined hour. In conjunction with this switching arrangement contact-making thermostat levers automatically switch the heating element out of the circuit when the compartment has reached the proper temperature.

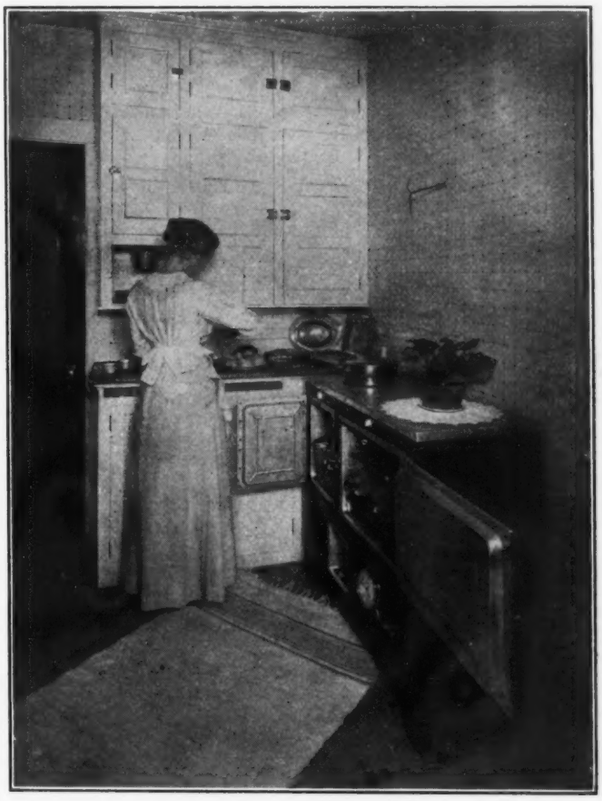


FIG. 2—ELECTRICAL KITCHEN IN AN ELECTRICAL SUBURB

VARIATION OF TYPICAL CUSTOMERS' BILLS

Period	Customer No. 1, Kw-hr.	Customer No. 2, Kw-hr.	Customer No. 3, Kw-hr.
First month	201	166	88
Second month	153	83	99
Third month	90	96	90

Energy for lighting and cooking in these houses is purchased by the Wiltsie Realty Company from the Maumee Valley Light & Power Company at 2300 volts, and is sold in turn to the householders. The rates at which this energy is retailed are quite unusual. Under the terms of the company's minimum contract a consumer pays $3.50 per month and has the privilege of using 100 kw-hr. All energy over this amount is paid for at the rate of 7 cents per kw-hr. In case, however, the customer wishes to take a higher minimum, he may do so, paying for the contracted minimum number of kilowatt-hours at 3.5 cents per kw-hr. and the remainder at 7 cents per kw-hr. Energy for lighting and cooking is measured upon the same meter.

Experience has shown that at first the customer's bill will be above his minimum, but as the housewife learns the economic method of operating the stove the bills will be greatly reduced. Mr. R. B. Wiltsie, president of the Wiltsie Realty Company, declares that the secret of economic operation of this stove lies in performing as many operations as possible at one time. This operation, he says, not only effects economy in the operation of the stove but also teaches a woman to conserve her own time. The accompanying table shows how the bills of some of the families have ranged during three months' operation. One family of three which has lived in this suburb for twelve months found that its average monthly energy consumption is 84 kw-hr. for both cooking and lighting.

A "kink" resorted to for heating water for household purposes saves much in energy consumption. In brief, this device consists of an arrangement of pipes such that the hot water of the heating system passes in an outside compartment while the water for household use circulates in the interior. This scheme makes it unnecessary to heat water electrically and so eliminates one of the most expensive energy-consuming processes from the work of the electric stove.

Allied Gas and Electric Companies of New York Occupy New Building Together

The New York Edison Company, the United Electric Light & Power Company, the New Amsterdam Gas Company, the Standard Gas Light Company and the holding corporation, the Consolidated Gas Company of New York, are now occupying the latter's new seventeen-story building at 130 East Fifteenth Street, New York.

The New York Edison Company occupies a large portion of the new building, eight floors of which are devoted to its executive and department offices. This company has equipped a very complete electric kitchen where meals will be prepared for the officials of the organization. An elaborate electric appliance showroom is being furnished on the main floor, with an entrance on Irving Place. The main offices of this company were formerly at 55 Duane Street.

The United Electric Light & Power Company, which had its offices at 1170 Broadway for about ten years, had only about thirty office employees and three rooms, with a total area of about 2200 sq. ft., when it first occupied the Broadway quarters. Since then the office force has increased about 300 per cent, and the floor area of the new quarters is approximately 450 per cent larger than that of the original offices and 60 per cent larger than the offices which have just been vacated.

It is obvious that the grouping of the allied companies under one roof will prove decidedly advantageous for economic reasons, and the officials of the individual concerns are well pleased with the new quarters and expect to realize much advantage in every way from their occupancy.

There is an auditorium in the building, where lectures and discussions will be held, classes in public safety service betterment will be conducted, and the various company commercial and technical sessions will meet.

Illumination and Wiring

Nitrogen-Filled Tungsten-Lamp Illumination of the Filene Store, Boston

One of the first comprehensive applications of nitrogen-filled tungsten lamps to department-store service was recently placed in commission at the Filene store, Boston, Mass. The electrical equipment of this establishment, it will be remembered, was described in detail in the *Electrical World* of Sept. 20, 1913. The new high-efficiency lighting installation is the outcome of a desire on the part of the Filene company to avail itself of the most modern progress in interior and display lighting and represents a large amount of experimental study on the part of the management. The local applications of the new lamps include the general illumination of the main selling area on the street floor of the establishment, the adoption of nitrogen-filled units for window lighting, and the adaptation of similar lamps of high power and efficiency to a roof-sign program of unique characteristics.

FIG. 1—MAIN FLOOR, FILENE STORE, BOSTON, LIGHTED BY 750-WATT NITROGEN-FILLED TUNGSTEN LAMPS.

Use of New Units with Indirect Reflectors

The selling floors of the store are equipped with indirect lighting, and the first floor, in which the pioneer installation has been made, was previously lighted by fifty-three indirect reflectors, each containing six 150-watt clear-bulb tungsten lamps placed with tips up. On the first floor are fifty-three bays, each 20 ft. by 22 ft. in dimensions, the ceiling being 20 ft. high. The illumination formerly secured was thoroughly effective, but of a yellowish quality in comparison with the present results. The scheme of lighting now adopted consists of the replacement of the six tungsten lamps in each reflector by one 750-watt nitrogen lamp, burned with the tip downward, the lamp being hung from a ceiling outlet by flexible cord. The Filene company is experimenting with reflectors of various types, and the best results up to the present, in the opinion of its management, are obtained by the use of white-enameled or porcelain reflectors.

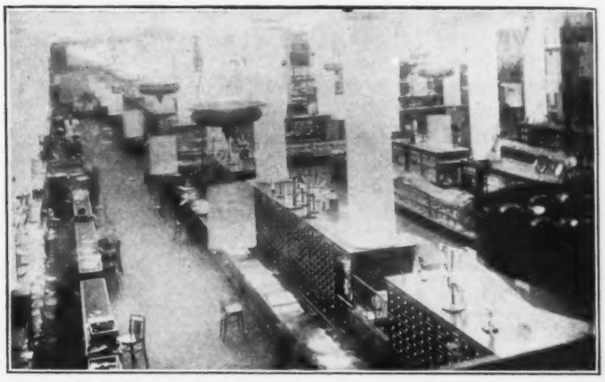
The quality of illumination secured by the use of nitrogen lamps in conjunction with indirect reflectors surpasses anything thus far known in the department-store world. The distribution is even throughout the entire selling floor, and the whiteness of the light pervading the establishment forms a marked contrast to the results previously obtained, attractive as they were. With an energy expenditure in the general lighting of the street floor of but 83 per cent of the former requirements, the store is far better illuminated, although the installation must be seen to have its full attractiveness appreciated. It is also noteworthy that the heating of the switchboard feeders supplying the street floor has been materially cut down by the substitution of the nitrogen-filled lamps. Again, since the new units have been used for general illumination it is no longer found necessary to operate the lamps in the special reflectors placed immediately above the showcases. The company has had the co-operation of various lamp manufacturers in conducting its experiments.

Lessons Learned with 750-Watt Lamps

Lamps of the 750-watt size were used from the first in the general floor lighting, but it was found necessary to place them with the tips downward in order to avoid excessive blackening. The Filene company's experience has clearly demonstrated the superiority of cement instead of wax in binding the skirts to the necks of the lamps. An early improvement was the lengthening of

the necks by about 4 in. to facilitate the disposition of heat and to provide additional space for blackening, besides giving a lamp length better adapted to the focus of the reflectors used. With the short-neck lamps it was difficult to secure a life in excess of 75 to 100 hours without loosening the wax by the heat developed at the base. With the long-necked lamp suspended tip downward, the convection currents carry the blackening up to the neck and better radiation of heat occurs. It is noteworthy, however, that the total heating effect in the store from the lamps is less than with the former tungsten groups which have been replaced.

It has been found that dust settling on the mirror reflectors used in the former installation has a tendency to cut down the flux of light more than an equal layer of dust on the white porcelain or enameled reflector. A number of types of reflectors are on trial, but the standard unit as at present considered and used for indirect lighting has a total diameter of 20 in., a working depth of 7 in. and contains a central plate-glass mirror 4 in. in diameter which is very effective in throwing rays upward from the region of the lamp tip. Sockets are not required in connection with the indirect reflectors, but where the lamps are placed near a mezzanine gallery used by customers as a waiting room a shade consisting of two 250-mesh screens has been



EIG. 2—STREET FLOOR SEEN FROM MEZZANINE BALCONY

placed between the observer's eye and the lamp filament and is entirely effective in cutting down the glare. The colors of goods displayed in the store can be much better examined by the light of the nitrogen-filled lamps than with the former units.

Several installations of nitrogen-filled lamps have also been made in the firm's business offices, the 250-watt, 500-watt and 750-watt sizes having been tried. With the indirect-lighting service in general use in the store, the 750-watt size has been found best. An example of the lighting rendered by a 750-watt unit in a single office is shown in the accompanying photograph (Fig. 5), the office being about 11 ft. by 16 ft. by 15 ft. in dimensions and finished in dark mahogany. The lamp is hung about 9 ft. above the floor in the reflector, tip downward. Another illustration (Fig. 4) shows the difference between the nitrogen-filled tungsten and ordinary tungsten lighting on the seventh floor of the store, where adjoining areas are equipped with the two types. With the older lamps the shadows on the ceiling are prominent, despite the use of indirect reflectors, while around the nitrogen units the ceilings are uniformly white.

Nitrogen-Filled Lamps for Window Illumination

A view is also shown of the window lighting furnished by a typical 750-watt unit, which floods the entire show space with a clear, soft white light. Direct lighting is used here, but the details of the reflectors are not yet fully available for illustration. The contrast with the former style of lighting is evidenced by the attention given to the window displays by passing crowds, as the store is situated in the most crowded part of the Boston business district. In order to cut down the heating of the fixtures a galvanized-iron ex-

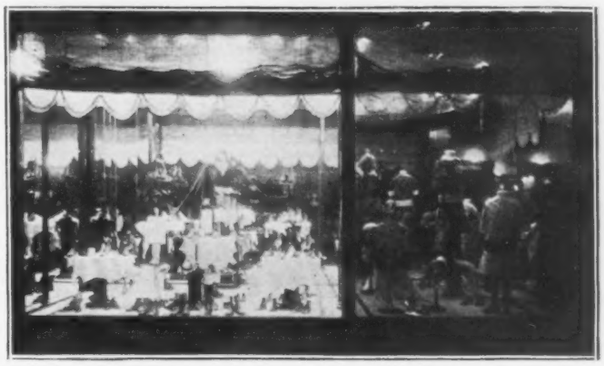


FIG. 3—CONTRAST IN WINDOW LIGHTED BY NEW-TYPE AND OLD-TYPE TUNGSTEN LAMPS

tension piece has been fitted to some of the lamps used for direct lighting, holes being punched in the sleeve to improve the circulation.

In the window shown in Fig. 3 the display at the left is illuminated by a single central nitrogen-filled lamp set flush with the ceiling, the window being about 9 ft. wide, 8 ft. deep and the lamp roughly 9 ft. above the bottom of the display area. At the right is a window lighted by eleven 60-watt, half-frosted tungsten lamps, the display space being about 6 ft. long and 6 ft. wide and of the same height as the left-hand section. The difference in the illumination is striking, although the expenditure of energy is only very slightly greater in the larger space.

Regarding the use of 750-watt nitrogen-filled lamps

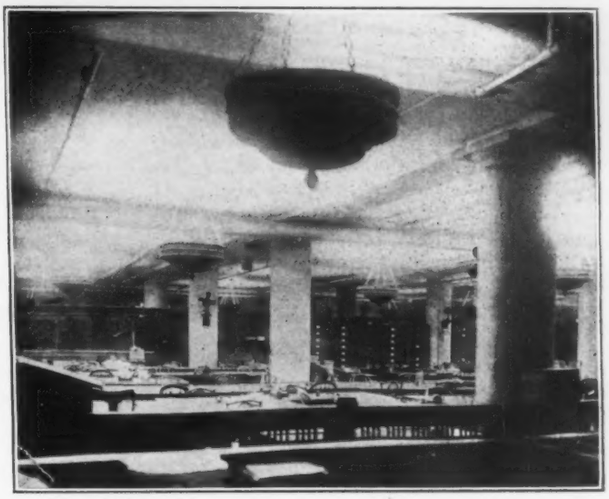


FIG. 4—ACCOUNTING DEPARTMENT, NITROGEN UNITS IN FOREGROUND, ORDINARY TUNGSTEN UNITS IN REAR

for show-window lighting, the Boston Board of Fire Underwriters has stated that there "is no objection to the proper installation of these lamps provided that the lamps and their attachments are properly insulated from the woodwork and other combustible material, that the sockets used do not contain sealing compound which melts below 300 deg. Fahr., and that the leads to

the lamp receptacle are of slow-burning wire or its equivalent."

A Roof Sign of 1000-Cp. Lamps

The Filene company recently installed a sign consisting of a letter "F" 7 ft. high and 5 ft. wide on the side of a wireless-telegraph tower on the roof of the store and 200 ft. above the street. Fourteen 750-watt lamps are used in this letter, which is of the box type, burning from dusk until midnight. The single letter has attracted much attention throughout the business district on account of the brilliancy of its outline against the winter sky. Plans are now being completed for the installation of four signs reading "Filene's" on the two wireless towers on the roof. One hundred and twenty 750-watt lamps will probably be required per sign. These are to be placed approximately 8.5 in. apart on centers, and will be protected against the weather by wired-glass windows and equipped with Mogul receptacles. They will be served by conductors run in lead-covered cables and will be ventilated at the top by galvanized-iron caps. The lamps are to be mounted tip downward and the circuits will

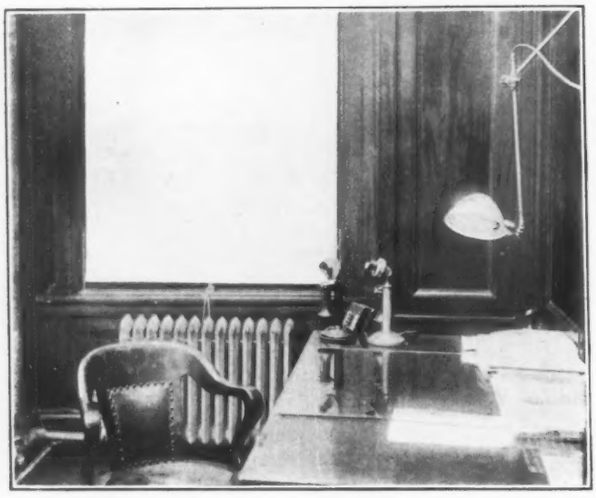


FIG. 5—MANAGER'S OFFICE PHOTOGRAPHED BY ONE 750-WATT NITROGEN LAMP WITH INDIRECT REFLECTOR

be appropriately subdivided. Elongated bases will be required. The lamps are all to be operated on a 118-volt direct-current multiple service.

With the completion of the signs and the standardization of indirect lighting by nitrogen-filled lamps on its principal selling floors, the Filene installation promises to yield a return in illumination for the energy required which will set a new mark in progressive department-store engineering.

Electrical Inspection Discussed from Different Angles

At a joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers on March 26 Mr. B. H. Glover, assistant electrical engineer of the Underwriters' Laboratories, delivered a short paper entitled "Electrical Inspection." In his discourse Mr. Glover confined his remarks to electrical inspection from the view of the laboratory man, the discussion later being taken up by Mr. Victor H. Tousley and Mr. H. B. Gear from the points of view of the municipal inspector and the electric-service company. After sketching the origin and history of the National Electrical Code, Mr. Glover said that the popular notion that the present code was prepared by the insurance companies was erroneous, for all changes in the code are passed upon by a committee, on which nearly all the prominent national electrical societies are represented.

To show how the number of approved fittings had increased, Mr. Glover said that the semi-annual booklet containing a list of these devices had grown from a short list to a pamphlet of 125 pages of condensed information. The inspector in the field was characterized as the purchasing agent of the public—one who renders the people a really expert service. Speaking of the good work which has been accomplished by the Underwriters' Laboratories, instances were pointed out showing how certain classes of devices have been standardized, eliminating faults which might prove hazardous to life or property.

On an appropriation of $123,860 for the year 1914, the Bureau of Electrical Inspection in Chicago, said Mr. Victor H. Tousley, chief electrical inspector of the city government, employs seventy-one men and will inspect all electrical wiring installed in Chicago from installations requiring but one lamp up to the largest, where thousands of lamps and many motors are installed. Mr. Tousley also commented upon the change in attitude of the public and the contractor toward the electrical inspector. People are now co-operating with the inspectors and doing work in compliance with the rules and regulations of the department of electricity of the city of Chicago.

One thing which is occupying the attention of the bureau at present is an attempt to secure control over the sale of electrical appliances. As has been demonstrated from recent accidents, some of these devices are unsafe and should no more be offered for sale without inspection than should food or firearms.

Speaking as a central-station man, Mr. H. B. Gear, engineer of distribution for the Commonwealth Edison Company, made the statement that the company maintains a bureau of inspection employing fifty men. He said that the company relies to a large extent upon the municipal inspectors to see that the work of wiring is done according to the city rules. In the past ten years central-station companies have been the gainers on account of rigid inspection, as hazards have been decreased and the confidence of the public has increased correspondingly.

Mr. F. J. Postel, chairman of the meeting, declared that, in his opinion, insurance companies could induce better wiring by offering lower rates to buildings with high-grade installations.

During the discussion of the paper which followed, the question of allowable fuse rating on branch circuits was brought up. In answer to questions, Mr. Tousley said that a new ruling effective April 1 would allow 10-amp fuses on branch circuits where formerly 6-amp fuses have been installed. This change has been made necessary on account of the many 660-volt devices now sold. Among those taking part in the discussion were Messrs. B. H. Peck, R. A. Huey, S. S. Wendt, F. A. Watkins, C. W. Naylor and P. B. Woodworth.

Intermittent Line Trouble Traced to Flaw in Insulator

The Marlborough Electric Company has a 6900-volt transmission line between Shrewsbury and Marlborough, Mass., a distance of about 10 miles, and although the right-of-way traverses a thickly wooded country the line itself has been very thoroughly cleared of all obstructing trees and limbs. On the night of a recent

severe rainstorm, according to Mr. O. W. Halladay, local manager at Marlborough, the circuit-breaker on this Shrewsbury line was opened by some intermittent trouble no less than sixteen times an hour. The fault could not be located during the storm, but on the second day afterward, following a thorough inspection of the lines, a porcelain insulator was found with a crack which evidently was a flaw in the original construction as it had been nearly glazed over.

The trouble experienced during the rainstorm is explained by Mr. Halladay in the following way: Water would get into the crack in the insulator and carry current to the pole through an iron pin. The circuit-breaker would then immediately open the circuit. As soon as the water had again soaked down through the insulator another flash of current would occur and the same operation would repeat itself. This happened regularly about every four minutes and continued throughout the duration of the severe rain, stopping after the rain had ceased.

The probable cause of the trouble—the cracked insulator—was found only after the theory that some such cause of trouble existed had been evolved.

Letters to the Editors

Rates for Electric Service

To the Editors of the Electrical World:

SIRS:—I have read with interest Mr. H. S. Cooper's comments in the *Electrical World* dated Feb. 7, 1914, on my letter on "Apportionment of Off-Peak Load Costs," published in the *Electrical World* of Dec. 20, 1913. In that short letter I attempted to make two points—first, that the timeworn argument concerning the unprofitableness of the small consumer at the highest rates is merely a matter of bookkeeping, and, in so far as one company is concerned, the argument is of no force whatever, as it is contrary to fact. The second point I tried to make is that the methods of bookkeeping used by public utilities—in this case electric lighting companies—were based on erroneous assumption concerning their relations to the public.

The first point Mr. Cooper does not attempt to gainsay, and hence it need not again be discussed. The second point seems to have aroused considerable opposition, and yet it seems to me that the opposition is based on a misunderstanding of the letter.

If I understand Mr. Cooper's argument, he does not reject the principle that the relation between the public utility and the public is that of agent and principal because the theory is wrong, but because in the present state of enlightenment the working out of such a principle, or the practical application of the principle, would lead to injustice to the service corporations, and to municipal ownership, than which, as he says, "in the present state of municipal governmental affairs no greater calamity could happen to the country," and furthermore that there is no clear line of demarcation between a public utility and a private company.

It is undoubtedly true that what is at present considered a private company may at some later date be considered a public service company. This trend is disclosed by the discussion now going on concerning the relation between the federal government and large corporations commonly called trusts. The lack of a clear definition or distinguishing mark between a private concern and a public service company does not seem to me necessarily to vitiate the fundamental principle as stated by Mr. Thelen and quoted by me.

Although the distinguishing mark may not be clear in every case, and although some public utility commission may exaggerate its authority, as seems to have been the case in Oklahoma, nevertheless in most cases the line of demarcation is clear enough for practical purposes. A public utility invariably secures its right to do business from the State, and thus indirectly from the public. That is, it performs a function which the public could perform for itself, but which it has delegated to an agent. In delegating some of its powers the public has endowed the public service company with some of the powers of government, such as the right to exclusive use of streets for its kind of traffic, and in some cases the right of eminent domain, that is, the right to take private property for public use. These are plainly public powers and can be exercised by a company only because so much of the authority of the state has been delegated to the corporation. As Justice Van Fleet says, "The public may be said to be the real owner and the company only the agent of the public." It seems to me that this is a clear enough distinction for practical purposes between a public service corporation and a private business. The individuals conducting a private business do not secure their right to do business from the government and perform no function of government.

If this principle is sound, I can see no reason why the public utility should be "run on principles and practices that violate absolutely every proper principle of private business," as Mr. Cooper seems to infer that it would be. The business should be conducted just as efficiently and in as complete accordance with good, honest commercial practice in the one case as in the other. The fundamental relation between the public and public utility should in no sense determine the manner in which the business is to be conducted. It is perhaps true, however, that a clear understanding of the relation that a public utility bears to the public might put a stop to certain practices that at present are by some considered as "proper principles and practices of private business," but which nevertheless are immoral—such, for instance, as those commonly known as stock watering.

I am unable to follow Mr. Cooper's logic when he argues that the recognition of the fundamental relation between the public and the public service corporation as mentioned will "instantly" result in municipal ownership, a calamity greater than any other that could happen to the country, as he says. I am urging the recognition of this principle because in the present condition of governmental affairs its acceptance will retard, if not prevent, municipal ownership of public utilities. When the public realizes that it is paying only a reasonable return upon the investment and service of the public utility, and that that service is efficient, the clamor for municipal ownership will cease. On the other hand, the public will not indefinitely continue to pay a high rate of return upon watered stock and capitalized franchises, even if at present such a charge may be considered as a "proper principle of practice of private business."

Mr. Cooper infers that I believe the management of a public utility should receive no reward for efficiency. I am unable to see wherein my former letter is subject to such interpretation. I am just as anxious as Mr. Cooper that justice shall be done public service companies, but at the same time the public is entitled to considerate treatment and justice. I am also well aware of the fact that opinions may and will differ in regard to what justice is in every case. For example, the people—that is, the public—no longer recognize the principle or view enunciated by a prominent public utility promoter and capitalist when he said, referring to capi-

talists, "we should be very deficient in mental ability if we were willing to invest $1,000,000 in a plant which might be worth $1,000,000 and no more. We certainly should be foolish to put money into it unless we had the possibility of making it worth $2,000,000." If I understand this man's methods of making the plant worth twice the amount invested, he means capitalizing it at twice the investment and fixing the rates so that dividends may be declared on the capitalization. It seems to me that the public is beginning to realize that it certainly would be foolish to subscribe to any such doctrine. If I am any judge of public opinion, I may say that it—the public—is perfectly willing to pay a reasonable return on the investment plus the risk, but is unwilling to mortgage the earnings of generations yet unborn to pay dividends upon values a great part of which society itself creates.

Such practices as these create the demand for public ownership of public utilities, and not the doctrine that a public utility is entitled to a reasonable return. This reasonable return may justly and properly include a share in the "extra profit caused by the efforts of those owning or operating the privately owned public utilities." The word "reasonable" is just as elastic as the definition of a public utility. The unreasonable charges are arousing public opposition. In this regard the regulation of the public utilities has not become definitely settled, as is pointed out by the editor of the *Electrical World* when he says: "Indeed, it is now weighed in the balance, and if it is found wanting, municipal ownership and operation is the logical outcome." This outcome will be considerably delayed if the utility commissions and courts recognize that the public service corporation is an agent of the public.

It seems that Mr. Cooper is almost persuaded to believe that the fundamental proposition concerning the relationship of the public and the public utilities is correct, for he says: "Mr. Thelen's and Professor Jansky's theories may possibly come to full fruition later on," etc. This is a recognition of the soundness of the theories, and they will come to full fruition when the public utilities cease to discriminate unfairly between large and small consumers and when the promoters of public utilities cease exploiting the public. When they do come to full fruition the public will cheerfully pay a "reasonable return."

Madison, Wis. C. M. JANSKY.

"Longitudinal" and "Transverse" Induction Phenomena

To the Editors of the Electrical World:

SIRS:—Language is not fixed, and in electrical engineering it may frequently be desirable to make use of new words or old words with new meanings. Not infrequently, however, the new expressions become established without any real necessity and without careful selection. Possibly due consideration has been given to the use of the terms "longitudinal induction," "transverse induction," "longitudinal voltage," etc., in the article on "California Investigations of Inductive Interference," which appeared on page 300 of the *Electrical World*, Feb. 7, but in the opinion of the writer these terms carry no new or distinctive meaning. In fact, they appear to give some erroneous impressions, so that it seems quite in order to submit them to some scrutiny before making use of the terms ourselves or considering that we know just what is intended when others use them. Quoting from the article:

"For the purpose of clearness it is convenient to classify induction phenomena as longitudinal or as transverse, referring to their manifestations on a metallic circuit. Longitudinal induced voltage refers to the voltage induced between the circuit and ground in the case of electrostatic induction and along the circuit between the two ends of the exposure in the case of electromagnetic induction. The transverse induced voltage of a circuit is the difference between the longitudinal induced voltage of the sides of the circuit. In the case of electrostatic induction this voltage acts between the two sides of the circuit, and in the case of electromagnetic induction it acts around the metallic circuit."

Now, it would appear that the meaning intended by the originator of the terms is that longitudinal induction is that which tends to establish a current in a circuit with earth return, and that transverse induction is that tending to establish a current in a metallic circuit. Or, coming down to more concrete cases, longitudinal voltage gives rise to telegraph-disturbing currents and transverse voltage to telephone-disturbing currents. In a practical case, of course, we must bear in mind that a metallic circuit may at any moment, through design or accident, become part of a ground-return circuit even though the grounds do not appear on the wiring diagrams, and that the wires forming metallic telephone circuits are frequently at the same time forming telegraph circuits with earth return. What has been described in the paragraph quoted as transverse induced voltage would appear to be nothing more than the difference of two longitudinal factors, which, according to the common usage of the words, would not result in any component in a transverse direction but merely in some differential or component in the same longitudinal direction.

It appears that only confusion results from the introduction of such terms as "longitudinal" and "transverse" into electrical circuits, but if they are to be used it would appear that the ideas which they are most likely to carry to the reader are not unlike those already well understood from "electromagnetic" and "electrostatic." For example, assume constant voltage at all points of a power-distributing circuit and a uniform separation from a telephone or telegraph line throughout its length. If there is no connection with the earth, the voltage between the telephone or telegraph wire and earth will be the same at all points and furthermore independent of the length of the line. This voltage might be termed "transverse" more properly than the differential voltage in a metallic circuit.

The writer realizes quite well the difficulty many energy transmission engineers who are unfamiliar with telephone and telegraph circuits and connections have in appreciating the fact that electromagnetic and electrostatic induction effects are quite distinct in their nature, as are also the results of these two forms of induction on typical telephone apparatus and on typical telegraph apparatus. Difficulties in making matters clear and discussions at cross purposes may have been responsible for the suggestion and use of the new terms to which exceptions are now taken.

It is suggested, therefore, that the needs of the case can be better covered by retaining the use of such terms as "electromagnetic induction" and "electrostatic induction," "grounded-circuit voltage (or current)" and "metallic-circuit voltage (or current)," "telegraph-disturbing voltage (or current)" and "telephone-disturbing voltage (or current)," and "voltage between wires" and "voltage to earth."

The various pairs of terms are by no means synonymous, and it does not appear that "longitudinal" and "transverse," or any other pair of terms which might be suggested, will meet all the needs of the case.

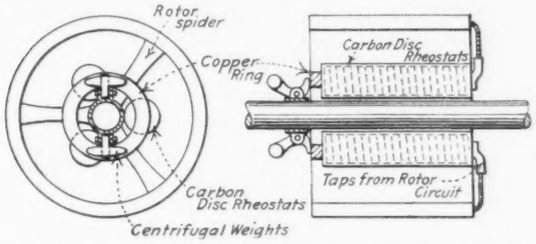
New York, N. Y. JOHN B. TAYLOR.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Automatic Control of Starting Resistance for Wound-Rotor Motors

Illustrated herewith is a method of automatically controlling the resistance in the rotor circuit of a polyphase induction motor for starting purposes which eliminates the need of slip-rings. Three carbon-disk rheostat



AUTOMATICALLY CONTROLLED CARBON-DISK RHEOSTATS IN ROTOR CIRCUIT

tubes are rigidly fastened to the rotor spider with their axes parallel to the shaft. A copper ring is attached to the movable disk on each rheostat, while the opposite-end terminals are connected to the three taps of the secondary circuit. Around the shaft of the motor is a collar carrying two weighted movable arms which press against the copper ring as the rotor speeds up, thereby compressing the carbon disks and reducing the secondary resistance. When the rotor has attained full-load speed the copper ring short-circuits the secondary terminals and no energy is lost in the rheostats. By using this auxiliary device a high-starting torque may be obtained without the use of slip-ring connections.

Relays and Service Continuity

In a paper recently read before the Boston Section of the American Institute of Electrical Engineers, Mr. George A. Burnham, chief engineer of the Condit Electric Manufacturing Company, Boston, Mass., discussed the relation of modern relay design to continuity of service on electrical distribution systems. The author pointed out that a purely lighting load can be handled satisfactorily by instantaneous relays, but with a feeder circuit subject to fluctuations, as on lines carrying motor loads, especially of the induction type, some time-limit feature must be resorted to to prevent continual openings of the breaker due to momentary excessive currents. He then described the application of inverse-definite time-limit relays to systems in which feeders radiate from both generating plants and substations. Properly designed installations provide for the automatic segregation of local troubles without interrupting service on trunk feeders. The inverse-definite curve is produced by designing the magnetic circuit of the relay so that the saturation point occurs at the intersection of the inverse and definite portions of the curve, the speed and time remaining constant beyond the point of saturation. In conclusion, the author discussed reverse energy relays in generator troubles.

An Alternating-Current Bakery Power Plant

Electric drive has been used throughout in the new bakery of the Acme Tea Company, Philadelphia, which has an output of 150,000 loaves of bread each ten-hour working shift. A 220-volt, two-phase, sixty-cycle, four-wire system of distribution is employed, the selection of the power-plant equipment having been made to conform to the character of "break-down" service available from the mains of the Philadelphia Electric Company, on which reliance is placed as an alternative source of power. Energy from the distribution system is furnished directly to the motors and lamps without the losses due to converting apparatus. The selection of alternating-current distribution, it will also be noted, permits the use of squirrel-cage motors which by reason of their simple construction are particularly suited to service under the conditions of flour dust prevailing in such a bakery establishment.

The building power plant is in the basement and is carefully isolated from the rest of the building in such a manner as to prevent any possible dust from coal or ashes reaching the bakery workrooms. In designing the plant one of the primary objects kept in mind was to provide against the possibility of interruption of the bread-making processes owing to failure of the energy supply. Duplicate boilers, engines and generators were therefore installed in the station, in addition to the emergency-service connection with the overhead mains of the local central-station company.

The boiler equipment comprises a pair of Parker

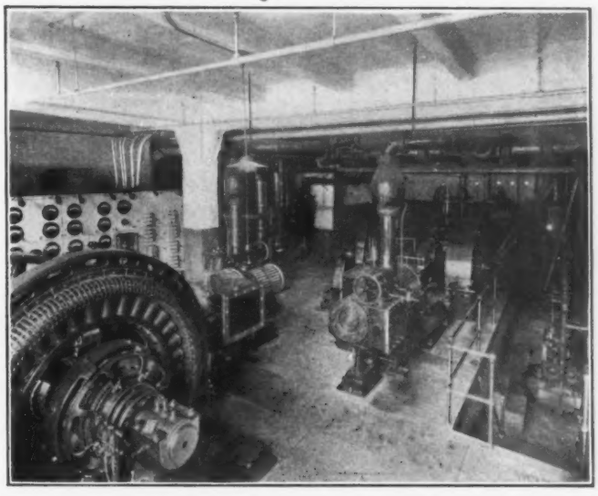


FIG. 1—ENGINE-DRIVEN ALTERNATORS IN BAKERY POWER PLANT

270-hp down-flow water-tube boilers, each equipped with McClave shaking grates. The flue gases are led aloft through a 54-in. Heinicke radial-brick chimney, 128 ft. in height. The two Skinner tandem-compound engines operate at 225 r.p.m. and develop 202 hp when running non-condensing at 125 lb. pressure. Direct-connected to each engine is a 150-kva, 240-volt, sixty-cycle, two-

phase revolving-field alternator provided with a self-contained 10-kw exciter.

The high-pressure piping system, which is designed for 125 lb. working pressure, is insulated with an 85 per cent magnesia covering. A 10-in. header connects the boilers with the engine room, 6-in. lines being provided between each boiler and the header. Safety non-

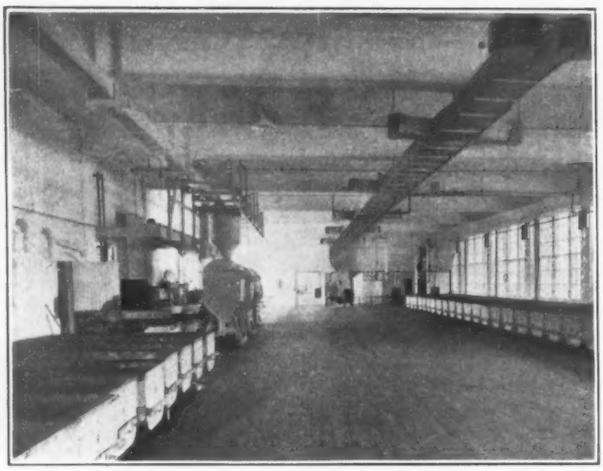


FIG. 2—MOTOR-DRIVEN MIXERS IN ACME BAKERY

return angle valves are inserted at the boilers and gate valves are placed at the connections to the header. In the engine room separate connections, valved at the header, are made to each of the two high-speed engines and to the Corliss engine operating the ammonia compressor for the refrigerating system.

Both the lighting and motor-service panels carry five four-pole switches, each controlling one of their respective feeders. All of these switches are of the double-throw type and are connected to separate busbars in the rear of the board so that either isolated-plant or central-station energy can be supplied interchangeably to any feeder without interfering with the energy furnished to any of the other feeders. This flexible arrangement makes it possible to supplement the output of the local plant with purchased energy at any time if desired, or to use either class of service exclusively if necessary.

The lighting system consists of five four-wire, 220-volt feeders carried to centers of distribution throughout the building. At these points four-wire lighting panelboards are provided, with a four-pole switch at each panelboard to control all the lighting on that board. The lighting units are wire-drawn tungsten lamps, those for the bake room being 250-watt units and those for the cooling and wagon rooms being 150-watt units. In all cases the large units are provided with bowl-shaped white-enameled steel reflectors. The walls and ceilings throughout the building are also white, and thus very efficient and satisfactory illumination is obtained.

Rapid Erection of a 12,500-Kva Turbine

Within twelve days from the time the Toledo (Ohio) Railways & Light Company's new 12,500-kva turbine was set on the side track at Toledo it was erected in the station and running under its own power. Load was applied to the machine two days later, establishing a remarkable erection record. The turbine, which is of the General Electric horizontal type, required nine cars for shipment from the factory The largest of its castings weighs 126,500 lb.

Transferring a Motor from One Source of Energy to Another While Operating

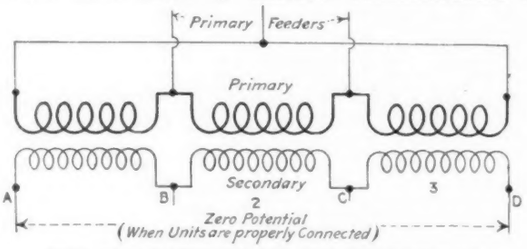
We have an exciter directly connected to a 100-hp, 550-volt, three-phase, sixty-cycle synchronous motor which is operated during the day by energy generated in our own plant. A three-phase service connection with the central-station company is available which supplies the same voltage and frequency as our plant and is capable of carrying a 100-hp load. Would it be feasible to use central-station energy to start the motor and then throw it while operating at synchronous speed and half load over onto our own generating system? G. A. N.

If your generating system is synchronized with that of the central station, a motor can be started on the latter and then thrown over onto your own energy supply without affecting the operation of the motor. When the two systems are disconnected, however, the entire load will be suddenly thrown on your generators, which will result in a slight momentary disturbance if the rating of your plant is small. After starting the motor on the outside service it will be necessary, before interchanging the sources of supply, to connect some air-core synchronizing reactors between your generator bus and the central-station service to bring the two systems into step. Messrs. Morgan Brooks and M. K. Akers, in a paper presented before the A. I. E. E. in 1906, pointed out that a 7.5-kw generator can be pulled into step with another generator quickly and without subjecting either to dangerous cross-currents if air-core reactors are connected between them limiting the synchronizing current to one-half the full-load rating of the smaller machine. Taking this ratio of synchronizing current to full-load current as a guide, you will probably be able to design reactors which will give satisfactory results. When the two systems are synchronized the reactors may be short-circuited and the central-station service switch opened, allowing the motor to operate on the energy generated in your plant. It is doubtful, however, whether you will be able to obtain reasonable rates for the starting current, as the electric service company would be justified in charging for the service rendered at a rate out of all proportion to the amount of energy actually delivered.

Connection of Transformer Secondaries

After the primary windings of three single-phase transformers are connected in delta to the source of energy, how can the proper connections of the secondary terminals be predetermined? J. D. Z.

If the transformers are of the same type as regards internal and external design, the general rule in connecting the secondaries is to follow the order of connections made in the primary circuits. When in doubt or when units made by different manufacturers are



TEST FOR PROPER SECONDARY CONNECTIONS

used it is advisable first to connect the secondaries as shown, tapping a voltmeter capable of reading at least twice the voltage of one transformer between *A* and *D*. If the arrangement is correct, the instrument reading will be practically zero. If it is not, units No. 2 and 3 should be reversed or interchanged until the potential between the closing ends of the delta is zero.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Wet Filtration of Cooling Air for Electrical Machinery.—D. A. HACKETT.—A discussion of the method of cooling electrical machinery by means of air cleaned by wet filtration, that is, by intimate contact with water in the form of a very finely divided spray. The author concludes that there is a fairly good case for the installation of wet air-filtration apparatus from the purely technical aspect. It undoubtedly produces clean air, and while the reduction in temperature may not, generally, be great, the air is certainly cooler after filtration. With regard to the danger of break-down, the author suggests that it would be of interest if some experiments were carried out under actual conditions to discover whether any material alteration in insulation resistance does occur. In this connection experience might be gained at first on low-voltage machines, where the risk of break-down is less. —London *Elec. Review*, March 13, 1914.

Cascade Induction Motor.—L. J. HUNT.—A very long paper, profusely illustrated by diagrams, in which the author discusses the principle of the cascade induction motor and gives the history of the development of the windings used in it, describing step by step the development of this type of motor.—*Journal* (British) *Inst. Elec. Eng.*, March 16, 1914.

Lamps and Lighting

Intermittent Tungsten Lighting.—A method devised by the French engineer Dussaud consists in lighting tungsten lamps for very short-time intervals with a much larger current than normal, thus obtaining, it is declared, improved efficiency. It is claimed that the life of the lamps does not suffer because they are connected to the circuit for short intervals only. For practical illumination purposes several lamps are mounted on the circumference of a rotating disk and are lighted one after the other successively at certain moments. Although the lamps are lighted in succession, it is claimed that there is no flicker. The system is intended especially for moving-picture projection lamps, because the lamp globes remain quite cool as the lamps are connected to the circuit only for short intervals. In this case the successive lighting of the lamps is carried out in synchronism with the change of the pictures, that is, sixteen times in a second. From the scarce information obtainable this would seem to be an interesting physical experiment rather than an illuminating engineering accomplishment.—*Licht und Lampe*, 1913, pages 489 and 729; briefly abstracted in *Elek. Zeit.*, March 12, 1914.

Electric Train Lighting.—An account of the discussion which followed the recent paper by T. Ferguson before the (British) Institution of Electrical Engineers. Rosenberg described at some length the Woodbridge constant-voltage system. McKinnon called attention to the great care taken in Germany and Scandinavia in keeping the storage batteries in good condition.—London *Elec. Review*, March 13, 1914.

Generation, Transmission and Distribution

Reactance Coils in Power Circuits.—E. P. HOLLIS.—An abstract of a paper read before the (British) Institution of Electrical Engineers on the use of reactance coils in power circuits for protection against transient excessive currents. The construction of current-limiting reactance coils entails a number of difficulties. In addition to the severe mechanical stresses incidental to a short-circuit, there are electrical stresses due to transient voltages, and the reactance coils may have to carry the current for many minutes. Iron must be avoided in the construction, and in view of the strong leakage field, any solid metal work in the coil will be the seat of eddy currents and may become unduly heated and cause a fire. Steel bolts, for instance, must not be used. In practice the coil takes several forms. In one, copper cable is wound under tension upon special wood supports which are bolted to a cylindrical concrete core. Another form of reactance coil is the porcelain-clad coil, the chief characteristics of which are that the pancake instead of the drum winding is

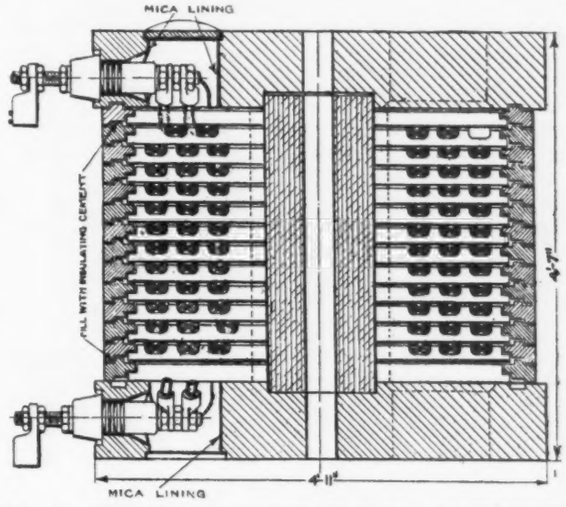


FIG. 1—SECTION OF PORCELAIN-CLAD, HORIZONTALLY WOUND REACTANCE COIL

adopted. The cable is inclosed in a porcelain case, with the result that the coil is smaller than one with air insulation. The reactors are built up of horizontally wound spirals (Fig. 1) supported in recesses formed in the porcelain arms. These arms radiate from a central core of alberene stone to an outer inclosing well built up of porcelain segments. The segments consist of two heavy concrete headers, one at either end, and these are fastened to the wall by a number of mica-insulated brass rods passing through the headers and porcelain segments. The conductors are insulated, and the arrangement of the interior of the coil gives a cellular construction which permits adequate self-ventilation. A typical coil constructed on this principle is as follows: Number of turns, 34; reactance, 4.2 per cent (20,000 kw, 6600 volts, twenty-five cycles); ohmic resistance, 0.00195 ohm; I^2R loss, 6.05 kw; eddy-current loss, 0.186 kw; total losses, 6.236 kw per coil; temperature rise, 33 deg. C.—London *Elec. Review*, March 13, 1914.

Single-Phase from Three-Phase Currents.—An illustrated description of three simple methods for obtaining single-phase supply from a three-phase system. The first employs two single-phase transformers, the second one transformer, and the third method three transformers. In all three cases the primary side of the system becomes unbalanced. If that is not desired, some method such as the one using three separate transformers giving three separate two-wire, single-phase circuits must be adopted.—London *Elec. Review*, March 13, 1914.

Traction

Rolling Stock.—H. E. O'BRIEN.—An illustrated paper read before the (British) Institution of Electrical Engineers in which the author discusses the factors affecting the design of electric railway rolling stock and then considers particular parts where it is economical to save weight, although the first cost may be much greater.—London *Electrician*, March 13, 1914.

1200-*Volt Direct-Current Traction.*—HERMANN J. MULDER.—An English translation in abstract of his recent German article on working experience with 1200-volt direct-current electric traction which has been already noted in the Digest.—London *Electrician*, March 13, 1914.

Installations, Systems and Appliances

Austrian Central-Station Statistics.—There are now in Austria 933 central stations, against 854 in 1913. Out of the seventy-nine new stations erected last year, twenty-four supply direct current using storage batteries, twenty-six direct current without storage batteries, and twenty-nine three-phase energy. The total rating of these seventy-nine stations is 39,341 kw. The total rating of all the 933 stations is 540,386 kw. Of these 933 stations 333 supply direct current and are equipped with storage batteries, 208 direct current without storage batteries, seventeen single-phase energy, four two-phase energy, 314 three-phase energy, and fifty-seven both three-phase and direct-current energy. Of the total number 418 stations are driven by water-power 144 by steam, 116 by internal-combustion engines, 102 by water and steam, seventy-seven by water and internal-combustion engines, thirteen by steam, water and internal-combustion engines, and fifty-three buy electricity in bulk. The aggregate rating of the water-driven prime movers is 274,445 hp, of the steam engines 446,280 hp, and of the internal-combustion engines 38,600 hp. Fifteen new electric railway lines have been opened during the year or are in course of erection, with an aggregate length of 321 km (193 miles), while eight electric roads, with a total of 49 km (29 miles), are being extended or rebuilt. The total length of all electric roads in Austria is 1408.6 km (845 miles), against 1039.4 km (623 miles) in the preceding year. Seventy-three roads (1166 km of track) are operated by direct current, and six lines (243 km of track) are operated by single-phase energy.—*Elek. Zeit.*, March 12, 1914.

Central-Station Statistics of Denmark.—R. J. JENSEN.—A review of the status of central-station statistics in Denmark. For 1913 the total number of stations was 346, with an aggregate rating of 57,000 kw. Two stations alone—those at Copenhagen and Fredericksburg—have an aggregate capacity of 29,000 kw, that is, more than all the other 344 stations together. Some data are given on the rates charged by the two principal stations.—*Elec. Zeit.*, March 12, 1914.

Gas Versus Electricity.—J. G. NEWBIGGING.—Extracts from his presidential address before the Manchester District Institution of Gas Engineers. The author is the engineer of the municipal gas department of Manchester. He discusses the competition of gas with electricity, differential prices for gas, and the relation between municipal gas and electricity departments. In Manchester the most active expansion of the gas supply is in the direction of gas cookers and gas heaters. In the electricity department of Manchester there has been a marked expansion in the direction of motor service. The author suggests the possibility of municipal gas and electric departments being operated together instead of in competition with each other.—London *Electrician*, March 13, 1914.

Sheffield.—The first part of an article in which a historical sketch is given of the gradual development of the electric power supply system of Sheffield. The new station at Neepsend, from which two and three-phase alternating current is supplied, is also described.—London *Electrician*, March 13, 1914.

Electric Power in British Woolen Mills.—An illustrated article on a typical electrically driven woolen mill in Oxfordshire. Individual drives are employed wherever possible.—London *Elec. Review*, March 13, 1914.

Automatic Motor Starter.—BRUNO THIEME.—An illustrated description of an automatic motor starter based on the use of a strip of two metals welded together so as to form one strip. If these two metals have different coefficients of expansion, they form a spring which in a change of temperature contracts or expands. The arrangement is shown in Fig. 2. There is a series of bimetallic strips Z which on heating bend and thereby make contact with the contact pieces B. Each pair of bimetallic strips Z and contact pieces B is provided with

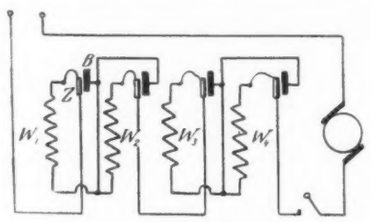


FIG. 2—CONNECTIONS FOR AUTOMATIC MOTOR STARTER

a resistance W. The current passes through the first metallic strip Z, then through resistance W_1 and resistance W_2 into the next two bimetallic strips, then through the next two resistance coils into the fourth bimetallic strip, etc., as shown in the illustration. When the switch is closed the current may be 3 amp. The first bimetallic strip Z is dimensioned in such a way that a current of 2 amp heats it so as to make contact with B. When Z makes contact with B, W_1 is disconnected and the current enters directly into the second resistance coil W_2. If the current is now 4 amp, the next bimetallic strip is so designed that a current of 3 amp will be sufficient to make contact with its contact piece and so on. The time in which all the coils are disconnected may be varied by adjusting the radiation surface of the bimetallic strips. When the motor is disconnected, all the bimetallic strips go back into their original position. —*Elek. Zeit.*, March 12, 1914.

Electrophysics and Magnetism

Electric Ignition of Gaseous Mixtures.—W. M. THORNTON.—A note on a (British) Royal Society paper in which the author gave an account of an experimental examination of the mechanism of ignition of gaseous mixtures by electric sparks. It was found that there are two distinct types of curves connecting the percentage of gas in air and the least current which, when broken, causes ignition by the break-spark. In one curve, characteristic of continuous currents, the current required is proportional to the percentage of gas

present; in the other, representing alternating current, it is a quadratic function of the percentage, having a minimum at the mixture giving combustion midway between CO and CO_2. In the paraffin series the minimum continuous current is the same for all the gases, but with alternating current the gases with more complex molecules require larger igniting currents. The slope of the one type and the minimum current of the other are both proportional to the number of atoms in a molecule of combustible gas. It is inferred from the observations that ignition by continuous-current break-sparks is largely ionic or electronic, but that by alternating currents is more nearly a simple thermal process. The gases examined were hydrogen, carbon disulphide, benzine, alcohol and the paraffin series up to pentane.—London *Electrician*, March 13, 1914.

Photoelectric Action.—O. W. RICHARDSON.—A highly mathematical paper on the theory of photoelectric and photochemical action. The author calculates the amount of energy which is abstracted from the radiation when one electron is liberated.—*Philos. Mag.*, March, 1914.

Electric Conductivity of Metals.—W. F. G. SWAN.—A highly mathematical paper giving an expression for the electric conductivity of metals as deduced from the electron theory.—*Philos. Mag.*, March, 1914.

Electrochemistry and Batteries

Ionic Dissociation.—F. P. WORLEY.—An article on the decline of the hypothesis of ionic dissociation. In the author's opinion, the hydrolytic activity of acids, and indeed the chemical activity of electrolytes generally, does not support the hypothesis of ionic dissociation, though it most emphatically shows the close connection between chemical and electrolytic activity, irrespective of any theory of the nature of electrolyte activation. Chemists have greatly neglected the distinction between these two issues and have advanced as evidence in favor of the Arrhenius hypothesis what really is evidence only of the close connection between electrolytic activity and chemical activity. This is especially true of hydrolytic phenomena.—*Philos. Mag.*, March, 1914.

Telegraphy, Telephony and Signals

Vibrating Relay.—W. JUDD.—A paper on the vibrating relay invented by K. Gulstad. This relay, while several times as sensitive as the ordinary polarized relay, is at the same time much more stable in the presence of disturbances from neighboring lines or from a defective duplex balance. It is applicable only to double-current Morse signaling and is efficient on all land lines and on submarine cables having a *KR* of from 0.5 to 0.75 second. The somewhat remarkable combination of increased sensibility to signals and increased stability against disturbances is explained by a consideration of the vibratory circuits. A diagram of the relay is shown in Fig. 3. Premising that no line current is present, it will be seen that when the tongue of the relay comes in contact with one or the other stop a condenser is charged through one relay auxiliary winding, pressing the tongue momentarily on this stop. Then, the condenser being charged, the current rises in the opposite auxiliary winding, through an external resistance, and pulls the tongue off, when the discharge current from the condenser flowing through both auxiliary windings throws it vigorously over on to the other stop. The same cycle of operations is then repeated with opposite polarity of the battery. In this manner a continuous and regular vibration of the armature and tongue is set up, with contacts firmly made and cleanly broken. The speed of these vibrations must be made equal (or nearly equal) to the prearranged speed of dot signals from the line to which the relay is applied, by suitable adjustment of the values of capacity and resistance in the local circuit, and the rate of rise of the local current must also be made to correspond with that of the cable current. When these conditions are fulfilled, the only duty left for the cable current is to control the vibrations. This control is obtained by furnishing the electromagnets of the relay with a separate winding through which the signals received from the cable pass. The heavier currents in this "main" winding—i.e., the cable "dash" or "space" signals—overpower the local vibrations and hold the tongue on one or the other stop, according to their polarity, until such time as, the dash or space being completed at the distant end of the line, the strength of the cable current at the receiving end falls below that of the local current by an amount giving a preponderance to the latter. The armature is then surrendered to the local forces, is pulled off and is driven vigorously over to the opposite contact by the discharge from the condenser. When "dots" are received from the cable their current amplitude is so small that only a very slight control, and in some cases practically none at all, is exerted over the tongue. Briefly stated, the resultant

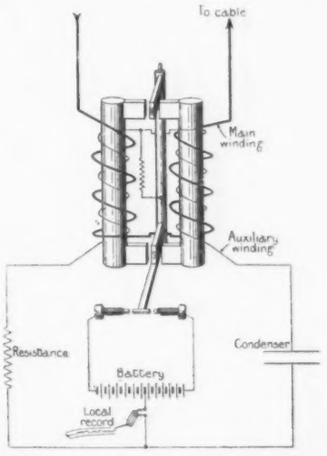


FIG. 3—DIAGRAM OF VIBRATING RELAY

effect of the controlling cable currents and the local currents in the relay is this: Where dots received from the cable are to be reproduced the vibrations are allowed to continue, and where dashes or spaces occur the vibrations are damped out. The short and long contacts of the tongue thus obtained are registered on the local recording instrument with all the increased firmness and definition supplied by the local forces.—*Journal* (British) *Inst. Elec. Eng.*, March 16, 1914.

Characteristics of Telephone Lines.—L. CAHEN.—A mathematical article illustrated by diagrams on the measurement of the characteristic constants of a telephone line. The author describes two methods. The first is a zero method in which the apparent impedance is measured by a compensation apparatus like the Wheatstone bridge when the wires at the other terminal of the line are insulated and when they are connected together. The second or deflection method consists in measuring at the same time the intensity of the current at the two ends of the line.—*La Lumière Elec.*, March 7, 1914.

Wireless Telegraphy.—PAUL LUDEWIG.—The first part of an illustrated article on the influence of meteorological factors on wireless telegraphy. The author discusses the propagation of electric waves, difference in the reception of waves during night and day, effect of the eclipse of the sun on April 17, 1912, and the effects of the season, the moon and the aurora borealis. The paper will be concluded.—*Elek. u. Masch.* (Vienna), March 1, 1914.

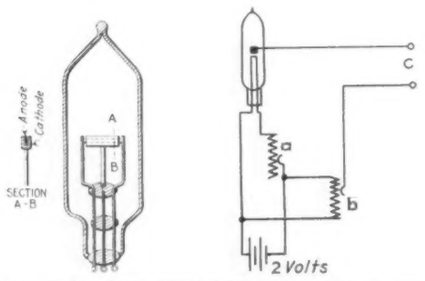
Wireless Telegraphy and Telephony.—W. H. ECCLES.—The first part of an illustrated article reviewing and analyzing recent patents in wireless telegraphy and telephony.—London *Electrician*, March 13, 1914.

Wireless Telegraphy.—J. HETTINGER.—An article, illustrated by diagrams, on resonance in high-frequency circuits in its special relation to wireless telegraphy.—*La Revue Elec.*, Feb. 20, 1914.

Relay.—LEE DE FOREST.—A letter claiming that the Lieben-Reisz gas relay is identical in every essential, except in its large size, with the audion amplifier.—London *Electrician*, March 13, 1914.

Telewriter.—C. BECKMANN.—An illustrated article giving a brief historical review of the development of the electric telewriter with special reference to the instrument of Gray. The modern form of the Gray instrument is described in detail and its various applications and its introduction into Germany are discussed.—*Elek. Zeit.*, March 12, 1914.

Cathodic Detectors.—An illustrated description of the Holweck valve which is based on the emission of negative electrons from incandescent bodies. This emission creates unilateral conductivity between the



FIGS. 4 AND 5—CATHODIC DETECTOR AND DIAGRAM OF CONNECTIONS

two electrodes. The emission of electrons from the cathode is rendered very strong by the means indicated in Fig. 4. The cathode has a very large surface of emission, ten times larger than that of filaments formerly employed for this purpose. The cathode surface is covered with a special oxide which has a higher emissivity than the filaments formerly used. Instead of making the distance between the anode and cathode greater than 4 mm or 5 mm, it is reduced in the present apparatus to 0.1 mm. Under these conditions the emission is extremely intense so that it is practically impossible for the valve to get out of order. Fig 5 shows the connection of the Holweck valve. *a* is the heating rheostat, *b* is the slide wire potentiometer and *c* the receiver. It is necessary to be able to regulate the temperature of the cathode and to introduce an additional emf in series with the anode.—*La Revue Elec.*, March 6, 1914.

Miscellaneous

German Electrical Industry.—The first part of a series of articles on the status of the different branches of German electrical industries in 1913. W. Kübler deals with central stations and agricultural transmission systems, Karl Czeija with the design and construction of electrical machinery, Beckmann with storage batteries and primary batteries, Heinrich Probst with switches and switchboards. The series is to be continued.—*Elek. Zeit.*, March 12, 1914.

Contracting.—L. DOLKART.—A paper on cost systems in electrical contracting.—*Jour. Western Soc. of Eng.*, December, 1913.

Mathematics and Engineering.—W. S. BUTTON.—A paper on the relations of mathematical theory applied to engineering.—*Proc. Eng. Club of Philadelphia*, January, 1914.

Book Reviews

ELEKTRIZITÄT UND VOLKSWOHLFAHRT. By Prof. A. Raps. Berlin, Germany: Georg Stilke. 138 pages, 55 illus. Price, 2.5 marks.

A book intended for the use of the general public, giving a brief review of the progress in modern civilization due to electrical applications. The subjects dealt with are telegraphy, telephony, telegraph and telephone cables, radio-telegraphy, electric generating stations, energy transmission, motor service in manufactures and agriculture, electric lighting, traction, electrotherapy and electrochemistry. The illustrations in the book are nearly all carefully prepared photo-lithographs and of better quality than are usually presented in a book for general distribution. The book will serve the non-technical reader who is interested in the modern applications of electricity and familiar with the German language. Such publications deserve to have a wide circulation, for the great contribution made by electricity to the public welfare cannot be pointed out too often or too emphatically.

HYDRAULIC TURBINES. By R. L. Daugherty. New York: McGraw-Hill Book Company, Inc. 156 pages, illus. Price, $2.

The principles and practice governing the design of hydraulic turbines cannot be treated exhaustively in a book of 156 pages, and the man who wishes to specialize in this particular branch of engineering will not be carried very far in his subject by a study of this book. The author's purpose, however, has not been to write a treatise on the design of water turbines, but rather to present the subject in such a form as to give the reader a general idea of water-power development and conditions affecting turbine operation, and also to assist him in the selection of a turbine suitable for various conditions likely to be encountered in practical work. Such items as stream gaging and stream flow as affected by rainfall, etc., although of the greatest importance in the development of water-power at any given site, are only briefly referred to, the principal features of the book being the description of the various types of waterwheels and turbines, the factors governing the selection of the most suitable type and size, and the cost not only of the turbine proper but also of the horsepower-hour, thus allowing comparison with other sources of power, such as steam. This chapter on costs is one of the most valuable in the book. Three clearly written chapters are devoted to the theory of the various types of waterwheels and turbines, while one chapter is given to the methods of testing and determining the efficiency of turbines. Chapter XIV—the last—deals with centrifugal pumps. The author rigidly excludes all ornaments of language and confines himself to terse expressions of fact in sentences that cannot be involved or obscure because of the extreme economy of words used in their construction. The result is that a very great amount of instructive and useful matter has been compressed into a comparatively small number of pages. The illustrations, whether line drawings or reproductions of photographs, are good and clear. These include such up-to-date photographs as the 10,000-hp turbines at Keokuk and the 22,500-hp turbine built by the Allis-Chalmers Company for the Pacific Coast Power Company. Professor Daugherty has produced a book for which there is an undoubted demand. He has done his work well and kept within the limits set for himself. All those interested in the development of water-power, whether on a large or small scale, including electrical engineers and operators on hydroelectric schemes, should welcome this book.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Portable Electrical Grinders and Drills

The portable electrical tool-post grinder and drill shown in the accompanying illustrations operate both on direct current and on alternating current of any frequency up to sixty cycles. The motors used are form-

FIG. 1—PORTABLE TOOL-POST GRINDER

wound and are impregnated with bakelite. They are kept cool by means of small fans.

The grinders are equipped with ball bearings, which are incased in dustproof chambers packed in grease. These tools are manufactured in sizes of ⅙ hp and ¼ hp and run at speeds of approximately 6000 r.p.m., thus making them effectual for internal grinding.

The drills are made in ⅜-in. and 1-in. sizes and are

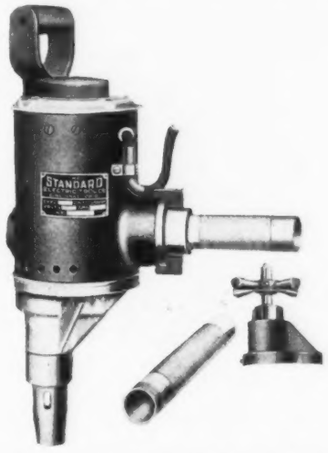


FIG. 2—PORTABLE ELECTRIC DRILL

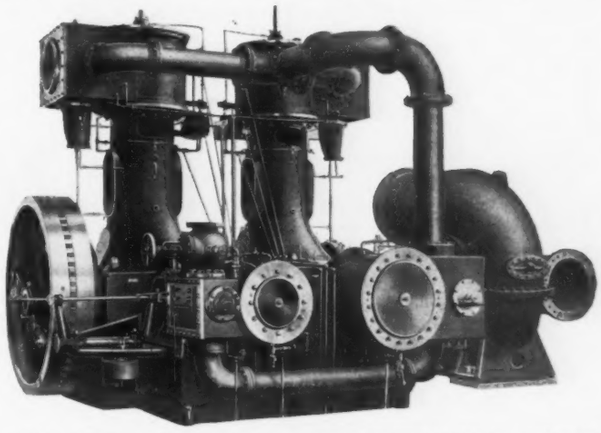
similar to those described in the *Electrical World* for Jan. 11, 1913, page 112, and March 8, 1913, page 535. Ball bearings are used throughout. The gears are of case-hardened steel and are incased in grease.

These Universal grinders and drills are the product of the Standard Electric Tool Company, Cincinnati, Ohio.

Four-Cylinder Triple-Expansion Engine

A high-speed four-cylinder engine of the triple-expansion type, which is used in driving centrifugal pumps and which is known as the American-Ball engine, is manufactured by the American Engine & Electric Company, Bound Brook, N. J. The accompanying illustration shows a 1000-hp unit operating on 250 lb. initial pressure and 25 in. vacuum. The unit is of the double-angle type. The high-pressure cylinder is shown in the foreground and the intermediate-pressure cylinder to the right. The two low-pressure cylinders are vertical as illustrated.

All parts are supplied with oil from two central storage tanks, which are placed between the two vertical low-pressure cylinders. The oil collects by gravity and is then filtered and finally returned to the elevated tanks by two pumps operated by the valve-gear rocker arms of the horizontal cylinders. One of these



HIGH-SPEED FOUR-CYLINDER TRIPLE-EXPANSION ENGINE

pumps with its plunger can be seen at the left in the cut. Indicator cocks are provided for all four cylinders, and there is a permanent reducing motion on each cross-head. The governor is of the inertia type.

Electric Combination Lock for Ignition Engines

An electric device which renders ignition engines inoperative until a certain predetermined combination is solved is being introduced by the H. W. Johns-Manville Company, New York. It consists of a clock-like instrument with two movable knobs operating the hands attached, and it has six electrical connections which may be protected by flexible conduit to prevent tampering. The device is particularly adapted to automobiles and launches, thousands of which, it is said, are stolen each year.

The instrument grounds the battery and magneto circuits through an alarm bell until the hands are set to the combination. If an attempt is made to start the engine by turning the ignition switch, the electric bell sounds an alarm. There is also, when a high-tension

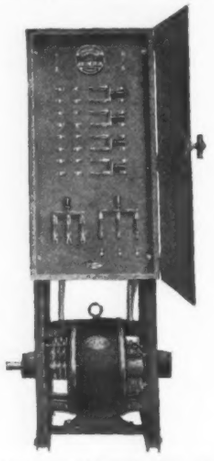
magneto is used, no possibility of operating the engine by connecting the magneto directly with the distributer, for the magneto ground can be removed only by rewiring the car. By using this electric lock, it is asserted, the cost of burglar insurance and the number of accidents due to incompetent drivers will be considerably reduced. It is impossible for a person riding in an

ELECTRIC COMBINATION LOCK

automobile equipped with this device to learn the combination used, for as soon as the car starts the hand locking the battery can be turned to any position while the magneto-lock hand can be moved about five spaces from the predetermined position. When using this lock the fire-insurance risk is not increased, for the car can still be pushed out of the garage in case of fire.

Integral Converter Set for Moving-Picture Theaters

A rotary-converter outfit combining in one unit, 30 in. by 30 in. by 72 in., all resistors, fuses and switches necessary to control any desired number of arcs for moving-picture work has been brought out recently by the Northwestern Electric Company, of Chicago. Designed to operate on potentials of 110 volts, 220 volts and 440 volts and at frequencies of twenty-five cycles, thirty cycles and sixty cycles, the units are built in six sizes

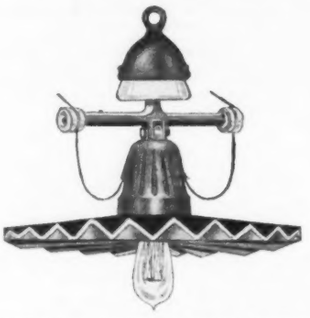


ROTARY CONVERTER SET

ranging from 2.5 kw to 7.5 kw. The direct-current pressure delivered from the rotary converter may be varied from 60 volts to 80 volts by changing resistances and transformer taps. A double-throw switch is provided for each lamp so that either alternating or direct current may be used at the arc. The converters were described in the *Electrical World* of Oct. 4, 1913.

Outdoor Swinging Fixtures

Incandescent-lamp fixtures of the center-span and rope-suspension type having two swivel joints, one above and the other below the insulator arm, are made by the Line Material Company, South Milwaukee, Wis. By means of these joints the tendency of the line wires to pull the reflector out of the horizontal and thereby prevent an even distribution of light is obviated. A locking screw is provided in case it is desired to have

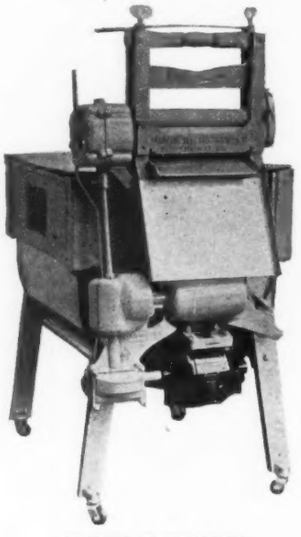


OUTDOOR LIGHTING FIXTURE WITH SWIVEL JOINTS

the joint below the arm rigid; in certain exceptional cases this is necessary. A fixture equipped with two swivel joints is shown in the accompanying illustration. This device is known as the "Kyle Line" bracket, and the provision of a joint below the insulator arm is considered to be an important improvement.

Electric Washing Machine

The electric washer illustrated herewith is being placed on the market by the Michigan Washing Machine Company, Muskegon, Mich. The operation of this machine is controlled entirely by push-buttons. All moving parts are covered, and an automatic electric



ELECTRIC WASHER

wringer release insures safety to the operator's hands. Ball bearings are used where the greatest strains occur and bronze bearings are employed elsewhere. The moving parts are designed to run quietly and the materials are so selected that the wear is small. Adjustment is also provided for wear. The machine is driven by a small Westinghouse motor.

Commutator Slotter

A tool for cutting mica on the commutators of electric generators and motors is shown herewith. The device cuts a smooth slot with a rounded bottom. The cutter is a special form of file and is straight and very

SLOTTING DEVICE FOR CUTTING MICA ON COMMUTATORS

hard. The operation consists first of starting one or two slots without the guide shown, then, after adjusting the cutter and guide, the guide is used in the slots already made, the tool being worked back and forth. The guide is lifted when the cutter has started. This slotter is made in three sizes and is manufactured by Mr. F. R. Alley, 808 Cobb Building, Seattle, Wash.

Porcelain Socket for Fixture Installation

A push-button porcelain fixture socket has been placed on the market by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This socket, which is shown herewith, is attractive in appearance and is rated at 660 watts and 250 volts. The same small quick make-and-break mechanism used in the pendent socket and other switches manufactured by this company has been adapted for this device. Instead of the usual iron set screw for securing the socket to the fixture, a locking ring is provided which secures the socket firmly to the

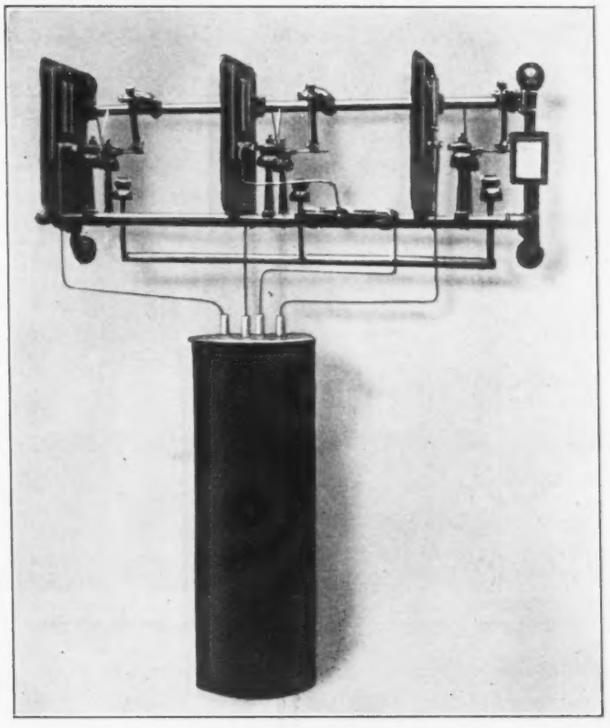
PUSH-BUTTON PORCELAIN FIXTURE SOCKET

fixture regardless of the usual differences in the diameters of fixture nozzles. For bathrooms, laundries and rooms having cement floors these "shock-proof" porcelain sockets are particularly suited. The push button employed in operating this socket is similar in design to those used with other sockets put out by the same company.

An Electrolytic Lightning Arrester

A lightning arrester with a charge-and-discharge resistor in series with a standard electrolytic element for the protection of cable systems, motors and generators connected directly on a line without transformers, or transformers with weak insulation on their end and turns, has been placed on the market by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. The resistor limits the charging current to a low value and damps out any surges that may result in charging, particularly if the system contains enough capacity to produce resonance. The arrester is designed for circuits of pressures ranging as high as 14,500 volts.

The electrolytic element consists of treated aluminum trays stacked on top of each other and separated and insulated by porcelain spacers on the periphery of the



LIGHTNING ARRESTER

trays. The number of trays in a stack depends upon the normal voltage of the line on which the arrester is to be used. The stacks of trays are included in frames, and each tray is filled with electrolyte. The stacks are placed in welded-steel tanks and are immersed in oil. In actual operation, a film of the electrolyte forms on the surface of each tray. This film has a high resistance at normal voltage, but the resistance becomes very low at high voltages. It therefore forms a free path for the current at abnormal voltages or for static charges, but upon the cessation of the abnormal stress the film instantly regains its high resistance.

The trays and electrolyte are arranged in such a manner that the electrolytic element acts as an electrostatic condenser. The flow of current due to the capacity of such a condenser varies inversely as the frequency of the circuit. Thus, at normal commercial frequencies, the flow of current is small, but at the high frequencies of lightning discharges and static disturbances considerable current flows through the element, increasing the action of discharging the static charges and preventing flow of current at normal fre-

quency. On an electrolytic arrester being charged surging currents are set up in the system. Under most conditions these are harmless, owing to the insulation of the apparatus connected in the same circuit. However, as above noted, there are cases in which these surges are dangerous, and in order to remedy this danger the graphite resistor is used to damp out the surges and limit the charging current to a low and safe value.

This resistor is connected in series between the horn-gap and the arrester in each phase. It is shunted, however, by a series of non-arcing metal spark-gaps which are auxiliary to the main horn-gap. While charging, the horn-gap is short-circuited as usual and at the normal voltage of the circuit the charging current takes the resistance path rather than the shunt auxiliary-gap path. On the occasion of a discharge due to lightning or static disturbances the auxiliary spark-gap path is easily broken down, and the discharge passes through it instead of through the resistor. After the circuit has been restored to normal voltage and frequency the auxiliary spark-gaps cannot maintain the circuit and it is shunted to the resistance path. This action is facilitated by the use of multiple gaps between non-arcing metal. The resistor limits the amount of dynamic current flowing, and thus helps in the final action of opening the circuit by the rise and final break of the arc on the horn-gap.

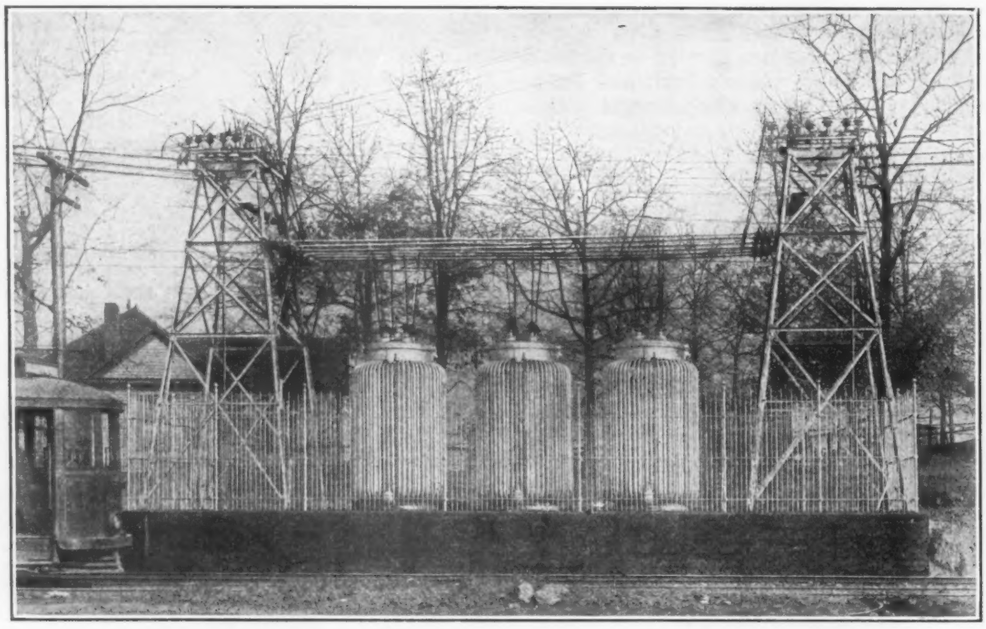
Outlet Box Holder

An outlet-box holder has been designed which will save the time and labor usually consumed in measuring and fitting boards on which to fasten outlet boxes between wooden floor joists. The device consists of two pieces of No. 14 gage sheet iron. One short strip containing two rectangular slots may be attached to the joist and box without obstructing the knock-outs in the back, while the longer piece which engages with the slotted strip in a slot-and-T-lock joint can also be nailed to the joist, making a rigid triangle. The outlet box can be fastened to the short strip with the same bolt which is employed to hold the fixture stem.

Outdoor Transformer Substation

The outdoor substation installation pictured herewith is in service on the lines of the Georgia Railway & Power Company, being about 2 miles from the center of the city of Atlanta, along the South Decatur trolley line. This substation serves for stepping up the pressure of 11,000 volts used in and around Atlanta to 22,000 volts, at which potential the substation supplies energy to the Stone Mountain-Covington-Monroe transmission line, which has a total length of about 40 miles. This 3000-kva substation receives its energy over the Atlanta line from various sources, including the new Tallulah Falls power station 90 miles away, the Bull Sluice station at a distance of 15 miles and two steam stations in Atlanta.

The outdoor substation has been in operation about six months, during which time, it is reported, absolutely no trouble has been experienced, although the nearest operator or attendant is 2 miles from the station. In the illustration are shown the 11,000-volt line on the left and the outgoing 22,000-volt lines at the right.



OUTDOOR SUBSTATION INSTALLATION

Each of the three Westinghouse transformers weighs about 12 tons, and to handle these units without difficulty a special I-beam construction was used between the car body on which they were transported and the concrete platform on which they are now installed. The concrete platform is the same height as the level of a car floor and the transformers were simply skidded along the greased surface of the I-beams to their proper places.

The two steel structures shown, each of which carries a three-pole Burke high-voltage air-brake switch, lightning arrester, choke coil, and fuse, are examples of standard models of outdoor substations built by the Transmission Engineering Company, Pittsburgh, Pa., and equipped with switching and protective apparatus manufactured by the Railway & Industrial Engineering Company, of the same city. The towers are provided with U-bolts from which tackle can be suspended to lift the transformer coils out of their tanks in case repairs or inspection should prove necessary. The station is inclosed by an iron picket fence as shown.

Jobber, Dealer and Contractor

Contractor Furnishes Festoon Lighting for Automobile Show

Twelve city blocks in the heart of the business district of Columbus, Ohio, occupied mainly by automobile and automobile-accessory salesrooms, were brilliantly illuminated by festoons, as shown in the accompanying

SPECIAL STREET LIGHTING FOR AUTOMOBILE SHOW

illustration, every night during Columbus' recent automobile show. Approximately seventy-five red and green lamps were used in each festoon, which stretched between trolley poles on either side of the street and over the sidewalks from the poles to the adjoining buildings. The Avery Loeb Company, electrical contractor, erected the displays, maintained them while in operation, and purchased energy from the central-station company for their operation. The contractor in turn collected for this work from the local automobile association, paying the central-station company for the energy registered on two meters hung at the distribution centers of the ornamental system.

Field Work of the National Electrical Contractors' Association

Under the direction of President Ernest Freeman and the other officers, the National Electrical Contractors' Association is making an intelligent and successful campaign to explain to the electrical contractors of the country its purposes and aims, and incidentally to increase its membership. The field work is directly in charge of Mr. G. W. Hill, special representative of the association, who was formerly with the Electrical Construction & Machinery Company, of Rock Island, Ill. Mr. Hill was employed to follow up the work of Mr. Duffield, except that that gentleman was engaged principally to increase the membership, whereas Mr. Hill's mission is of a rather broader scope. He introduces and explains the association's system of bookkeeping, and also explains the other branches of the association's work. In doing this missionary work Mr. Hill is also helping to make the association more valuable to its members.

Beginning last November, Mr. Hill started out in Wisconsin. In this State the electrical contractors were not particularly friendly to the national association, nor, indeed, in many cases to one another. Here Mr. Hill has been able to bring about a considerable change of feeling, and the state association, which has been perfected as the result of the suggestions of representatives of the national organization, will hereafter work with the National Electrical Contractors' Association. Mr. Hill then went into Michigan, and he practically doubled the number of members in that State belonging to the national association. He was also instrumental in bettering the feeling among electrical contractors in Michigan. In Iowa the general feeling of electrical contractors had been that the national association was too big and too far away from them to be much interested in their concerns. Mr. Hill showed them that this was an erroneous view. He later formed the new state association in Iowa, which is affiliated with the national body. Recently the special representative has been traveling in the South. In Arkansas he increased the membership of the national association and was instrumental in the formation of a state association, which has joined the national body. He has been working also with good result among the contractors in Missouri, Kansas, Illinois and Louisiana. He is at the present writing in Tennessee engaged in this interesting work. It may be added that the system of bookkeeping which the association, through Mr. Hill, recommends to electrical contractors is sold at less than cost and with the honest intent to help the electrical contractors of the United States to do their business in a businesslike way and to know how much it costs them to do business.

Advanced Electrical Merchandising and Contracting in Indianapolis

In an effort to put the retail electrical supply business and the electrical contracting industry (in this case combined in one company) on a higher plane, the Sanborn Electric Company, of Indianapolis, is taking a conspicuous part, as may be judged from the pictures of its new building and salesrooms given herewith. Indianapolis is a city of about 250,000 population, and the Sanborn Electric Company has demonstrated what may be done in the development of the retail electrical business in a city of that size. Its example may well be followed by many another electrical contracting and supply house throughout the United States.

The Sanborn Electric Company has been in the electrical contracting business for twenty-three years. Its

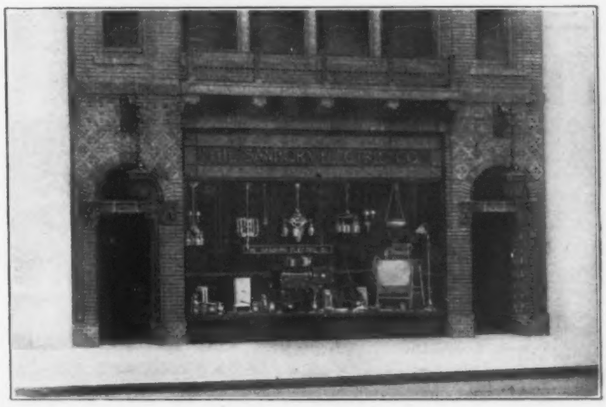


FIG. 1—SHOW WINDOW AND ENTRANCE OF THE SANBORN ELECTRIC COMPANY

operations have extended beyond Indianapolis, one recent large contract being in connection with the new Michigan Central Railroad terminal and office building in Detroit. The entire electrical equipment for this Detroit building, including the lighting fixtures, was furnished by the Sanborn company. The new building of the company in Indianapolis is well arranged and

unusually attractive. It was built and is owned by the Sanborn Electric Company and was especially designed to meet the present and future requirements of the company. It is of fireproof construction.

First-Floor Display Room

The front portion of the first floor is arranged for the attractive display of a large variety of articles of electrical merchandise, including electric stoves and heating utensils, washing machines, electric cleaners, cooking devices, etc. Glass showcases and wallcases are provided for the exhibition of merchandise. These cases are equipped with interior lighting, and the nickel-plated or copper appliances make an attractive display. Further, keeping these utensils in the showcases prevents their becoming tarnished and dirty.

One section of the wall is arranged with eight swinging display cases. These are about 5 ft. high with horizontal dimensions of 2 ft. by 4 ft. The backs of these wallcases are lined with black felt, on which are mounted small articles such as switches, receptacles, cut-outs, tungsten lamps, flashlights, etc. Immediately behind these cases are shelves which contain the goods that are displayed on the black backgrounds. This method permits the displaying of small objects which are generally hidden away in shelving. The fact that the article is in plain sight often suggests to the customer that he is in need of it.

Fixtures Displayed in a Suite of Beautiful Rooms

Passing from the display room the customer goes through what appears to be the front porch of a residence. From this he enters a vestibule which leads into a large reception hall. Thence the visitor is conducted into an English reception room, which, in turn, opens into a fully equipped library in Colonial style. There is also a French room, and this opens at the rear into a solarium finished in Caen stone, with tile floor and latticed ceiling. The lighting fixtures shown in these various rooms are suggestive of the periods of decoration represented, the whole being designed to give the public a correct idea of how fixtures will appear when installed in the home. A feature of these fixture showrooms is that every fixture is wired and lighted individually. Numerous outlets are provided on the ceilings, which are of residence height. By this plan the crowding of fixtures is prevented, and the fixtures are spaced a sufficient distance apart to show each one to the best advantage. Lighting fixtures for all classes of buildings are displayed.

Other Features of the Building

The two upper stories of the building are used for general offices, private offices, the engineering department, etc. A large basement affords storage and shop facilities. A rear entrance for employees has been provided. This provision brings the construction men to the construction superintendent's desk by the shortest course, and the passage is so arranged that it is not necessary for the construction men to pass through the retail department with their tools, ladders, etc. A room for employees is conveniently situated in the basement and is provided with welfare facilities such as lunch table, lavatory, shower baths, etc., as well as convenient receptacles for tools and clothing. The idea of the company has been to endeavor in every way to make the workman comfortable and to help him to maintain a neat appearance and to take pride in his work.

Mr. Sanborn's Views on Electrical Merchandising

Mr. G. M. Sanborn, the president of the company, is well known among electrical contractors. He was president of the National Electrical Contractors' Association in 1909-1910 and is at present a member of the executive committee of the association. He was chairman of the committee which developed the standard

FIG. 2—FIXTURE DISPLAY ROOMS OF THE SANBORN ELECTRIC COMPANY

FIG. 3—ARRANGEMENT OF STOCK IN GENERAL SALESROOM OF THE SANBORN ELECTRIC COMPANY

symbols for wiring plans, the universal data and sales book and the charts showing standard sizes of conduit for wires and cables. His company is a member of the Society for Electrical Development and has reproduced in its showroom the emblem and slogan of the society. Mr. Sanborn is a member of the board of directors of the Society for Electrical Development and an advocate of the principle of co-operation.

The president of the company is optimistic in relation to the future of the electrical contracting business and the retail electrical supply business. He believes firmly that the public is ready for electrical shopping facilities of the first class and that it only remains for the contractor and dealer to develop this side of the business. Mr. Sanborn believes that the electrical contractor is the logical and natural retailer for electrical merchandise and that he is better fitted to handle and develop this business than the electric-service company or any other department of the industry.

"However," Mr. Sanborn says, "the contractor must seize the opportunity. If he does not make the proper investment and display, and prepare himself to handle the retail trade, he must not complain if the central-station company or someone else does so. If the contractor takes his proper place in the field, others will naturally leave the business to him. The lighting company should realize that the contractor needs encouragement to invest his money in an untried venture and should refrain from offering undesirable competition to the contractor, but should lend him every assistance and encouragement to develop the field. This will be of mutual benefit. Much has been said of co-operation, but it should be remembered that co-operation with the contractor must be of the kind that allows him to make a profit while selling devices. The sale of these devices means a continuing business to the electric-service company."

New Interior Wiring Ordinance in Minneapolis

Considerable interest is taken by electrical men in Minneapolis in the revised wiring ordinance adopted by the City Council a few weeks ago. This ordinance specifies the carrying capacity of wires according to the standard adopted by the American Institute of Electrical Engineers. A section of particular interest reads as follows:

"Where the circuit load does not exceed 660 watts, sixteen sockets may be installed on such circuit, provided, however, that in a residence only twelve sockets may be connected to one circuit, except that in cases where a separate appliance circuit is installed to which at least three receptacles are connected, one in the kitchen, one in the dining room and one in the laundry, sixteen sockets may be connected to each circuit used for lighting only."

The object of this amendment is to encourage the installation of an independent circuit to be used solely for electrical appliances. Electrical contractors say that, with the increase in the number of allowable sockets from twelve to sixteen wherever the appliance circuit is provided, the total cost to wire an average residence will not exceed that required to wire a residence without the appliance circuit and with the allowable number of sockets per lighting circuit limited to twelve. The Minneapolis General Electric Company, which does the electric-service business of the city, has received a number of complaints from customers who have criticised the voltage regulation. Upon investigation the trouble has usually been traced to the use of some electrical appliance on an ordinary lighting circuit. It is anticipated that the changes provided by the new wiring ordinance will encourage the installation of separate appliance circuits—a result which will be desirable for all concerned.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

New Fuel-Oil Engine Put Out.—The Covington Machine Company, of Covington, Va., has developed a new internal-combustion fuel-oil engine, which it has just put on the market.

New Section in Nela Research Laboratory.—The "Section of Applied Science" is the latest addition to the Nela Research Laboratory at Cleveland, Ohio. This division, under the direction of M. Luckiesh and C. F. Lorenz, is intended to provide a connecting link between the purely scientific research work of that laboratory and the commercial applications which develop from such research.

Utility Company Buying Large Generating Units.—An order has been placed by the American Gas & Electric Company for two 10,000-kw steam-turbine generator sets, one of which is to be installed at the Canton Electric Company's plant and the other at the station of the Scranton Electric Company, to meet increased demands for electric energy from these plants. The General Electric Company is to supply this equipment.

Kerr Turbine Sales Progressing.—Recent sales of the Kerr turbine have included twenty-five machines for driving pumps, and some of the larger turbo-generator sets lately sold have an aggregate rating of 1375 kw. Among the purchasers of the latter apparatus were the Coy Paper Company, the Standard Oil Company, the Glasgow Electric Light & Ice Company, the Kerite Insulated Wire & Cable Company, and the Gulf Fisheries Company.

Overland Motor Car Company Increases Connected Load.—A contract recently closed between the Overland Motor Company and the Toledo Railways & Light Company adds approximately 1800 hp in motor service and 600 kw in lighting to the circuits of the electric-service company. The increase has been made in a new building containing about 800,000 cu. ft. of space in which the body and machine departments of the factory will be operated. This brings the total load of the Overland company to about 7000 hp.

Electric Soidering Iron Heaters Finding Ready Sale.—In the Feb. 7 issue of the *Electrical World* a note appeared describing a new form of electrically operated soldering iron heater recently brought out by the Current Electric Company, of Chicago, Ill. The company reports large shipments to a typewriter manufacturing company, a motor manufacturer and a telephone company. Smaller lots have been sold to manufacturing jewelers and to makers of sheet-metal apparatus. The device has also been pushed abroad, according to the makers, with very gratifying results.

Electric Welding of Sugar Tanks.—The Electric Welding Company, 220 West Forty-second street, New York City, has recently successfully repaired a number of sugar tanks for Arbuckle Brothers, New York, for which concern it does all work of this kind in accordance with its special contract plan. The life of these sugar tanks, which are used to contain hot sugar solutions, is limited, and corrosion at the joints and around the rivets is extremely rapid. Formerly, when the steel plates were corroded to a point where repair became necessary, either the tank was thrown out absolutely or new parts were inserted in place of the old ones and new rivets driven. Wherever patches were put in it was first necessary to cut out the old plate, drill holes, drive rivets and calk the edges. Such repairs were expensive and consumed a large amount of valuable time. By electric arc welding the removal of old plates and tanks has been entirely done away with. If a new bottom is to be put into a tank, a plate is flanged on all edges and dropped into the bottom of the tank on top of the worn-out sheet. It is then welded all around the edge to the edge of the bottom and to the sides of the tank. Corroded spots and pits are filled with new material and made smooth by chiseling and grinding. Where the plates are weak over a considerable area, plate patches are welded onto the old sheet and the edges tapered off so as to leave no place for the lodgement of material which will promote corrosion.

Edison Storage Battery Used to Operate Pontoon Crane.—In the Boston Navy Yard there has recently been constructed a large electrically operated pontoon crane intended for handling heavy and bulky pieces, such as turrets, boilers, guns and similar equipment for battleships. The crane is electrically operated throughout, its equipment including an Edison storage battery capable of 600-amp discharge at 220 volts for one hour, controlled by a Cutler Hammer magnetic-type controller. There is also a 100-kw Diesel-engine-driven direct-current generator which can be used either to operate the crane or to charge the battery.

Middle West Electrical Dealer Optimistic.—According to Albert Korst, vice-president of the Barber-Dwinnell Electric & Manufacturing Company, of Kansas City, Mo., that company is doing a splendid business, and the prospects for electrical business in general are brighter this spring than they have been for many years. The company has just completed the installation of a three-phase plant at Burwell, Neb., and of a storage-battery lighting plant at Milligan, Neb. It also acts as Western sales agent for the Century Electric Company, the Diehl Manufacturing Company, the Richmond Electric Works and the Kimble Electric Company.

Selling Company Formed to Handle Crowe Smokeless Stokers.—The National Stoker Company has just been incorporated under the laws of the State of Delaware, with main office at Covington, Va., and branches at 88 Wall Street, New York, and at 416 Fifth Street, N. W., Columbia Building, Washington, D. C. The capital stock of this corporation is $300,000, of which $150,000 is preferred and $150,000 common. Its officers are J. S. Ham, president, Covington, Va., and Frank Lyman, secretary-treasurer, 82-88 Wall Street, New York. The company was formed for the purpose of handling the Crowe smokeless stokers in the United States. The Covington Machine Company, of Covington, Va., will manufacture the stokers, and the National Stoker Company will devote all its energies to selling them.

Emergency Service Supplied by an Electrical Manufacturer.—The recent severe storm in the vicinity of New York gave to the Western Electric Company an opportunity to display its ability to meet sudden emergencies. On March 1 the territory around and between New York and Philadelphia was visited by an unusually severe snowstorm, which practically paralyzed the overhead lines for both telephone and telegraph service in the affected area, besides tying up the transportation service temporarily. The storm wrecked over 6000 poles in this district carrying important and heavily loaded telephone and telegraph lines. At the New York headquarters of the Western Electric Company the call for emergency service was anticipated, and the force had been collected and trucks were in waiting when the first call came in. About 1500 emergency orders were received and handled. The early orders were supplied from emergency stocks, and after that rush shipments were made from the nearest factories and wire mills, some of which were put on day-and-night schedules while the rush lasted. The total emergency shipments came to approximately 8750 tons, including 150 carloads of poles, 16,000 miles of wire, hardware, tools and line supplies weighing over 500 tons, 14,000 cross-arms, 50 miles of stranded wire, 50 miles of cable, and 200,000 insulators, weighing approximately 100 tons.

Comparative Durability of Various Woods for Cross-Arms.—The Western Electric Company, from years of experience with transmission-line equipment, has just published an interesting tabulation of the comparative durability of different woods used for cross-arms. It ranks Washington or yellow fir first, with a life of over thirty years, followed by "all-heart" long-leaf yellow pine, ten to twenty years; cypress, ten to twelve years; Norway pine, six to eight years; juniper, six to eight years; oak, four to eight years; "sap" long-leaf yellow pine, four to six years, and short-leaf yellow pine, three to five years. An instance is cited of a yellow-fir cross-arm cut and put into service fifty years ago and still carrying wires without a sign of decay. The statement is made that this wood does not require painting in order to withstand the attacks of the elements.

Industrial Plant Adopts Central-Station Energy to Raise the Quality of Product.—A 25-hp gas engine operating in the factory of the Lewis Welding Company, Toledo, Ohio, was recently replaced by a 35-hp electric motor operating from the mains of the Toledo Railways & Light Company. The engine in question had been driving, among others, a grinding machine producing automobile valve mechanism in which accuracy to within 0.0005 in. is desired. Tests on the gas engine showed that the speed of the machine at the cutting tool varied as much as 7 per cent. Tests on the same machine driven from the central-station circuit showed that the average variation was 0.3 per cent and that the maximum variation was 0.8 per cent. The grinding machine is one of a group, and this slight variation is attributed to belt slippage. In addition to allowing the operators of the grinding machine to do more accurate work, the motor has proved popular among the employees, who formerly complained about the heat given off by the gas engine.

Reorganization of the Dean Electric Company.—In the Dec. 20, 1913, issue of the *Electrical World* note was made of the plans on foot for reorganizing the Dean Electric Company, of Elyria, Ohio. Announcement has now been made of the formation of the Garford Manufacturing Company, which will take over the assets and liabilities of that concern. The Garford company has been authorized to issue $500,000 of 7 per cent cumulative preferred and $800,000 of common stock. The officers of the new company are A. L. Garford, president; A. G. Bean, vice-president; A. L. Patrick, treasurer, and John Watson, secretary. Its directors are the above and John Sherwin, John Brophy, H. H. Johnson and E. F. Allen. Secured creditors of the Dean company obtain under this reorganization notes equal to the face value of their claims and payable in from one to five years. Unsecured creditors receive these notes equal to 75 per cent of the face value of their claims, while the preferred-stock holders receive common stock of the Garford company equal to 20 per cent of their stock in the Dean company.

NEW YORK METAL MARKET PRICES

	Mar. 24		Mar. 31	
Copper:	Bid	Asked	Bid	Asked
Standard spot*	13.87½	14.37½	13.80	14.30
	Selling Prices		Selling Prices	
	£ s d		£ s d	
London, standard, spot*	65 7 6		65 2 6	
Prime Lake	14.75	to 14.87½	14.75	to 14.87½
Electrolytic	14.40	to 14.50	14.40	to 14.50
Casting	14.20	to 14.30	14.20	to 14.30
Copper wire base	15.50	to 15.75	15.50	to 15.75
Lead		4.00		3.80
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter		7.00		7.00
Spelter, spot	5.32½	....	5.32½	....
Tin, spot	38.70	to 38.80	37.85	to 38.25
Aluminum:				
Prompt delivery	18.00	to 18.25	18.00	to 18.25
Future	18.00	to 18.25	18.00	to 18.25

***OLD METALS**

Heavy copper and wire	13.62½	13.62½
Brass, heavy	8.62½	8.62½
Brass, light	7.62½	7.62½
Lead, heavy	4.00	3.80
Zinc, scrap	4.25	4.25

***COPPER EXPORTS**

Total tons to March 31.....44,898

*From daily transactions on the New York Metal Exchange.

Corporate and Financial

Consolidated Cities Company Increases Dividend Rate.—A quarterly dividend of three-quarters of 1 per cent was paid on April 1 on the outstanding stock of the Consolidated Cities Light, Power & Traction Company. An initial dividend of one-half of 1 per cent was paid on this stock on Oct. 1, 1913, and the same rate on Jan. 1 of the present year.

Dayton Company Purchases Wilmington (Ohio) Company.—The Dayton Power & Light Company has purchased the Wilmington Water & Light Company of Wilmington, Ohio. J. C. Martin, who has been president of the Wilmington Water & Light Company, is president of the Ohio Electric Light Association. F. C. Jeannot is now in charge of the plant at Wilmington.

New Stock Issue of the Shawinigan Water & Power Company.—An issue of $1,375,000 of new common stock has been announced by the Shawinigan Water & Power Company, of Montreal. Shareholders of record April 1 are allowed to subscribe to this stock at $120 per share up to April 30 on the basis of one share of new stock for eight shares of old, subscriptions payable in three instalments, $30 on April 30 and June 1 and $60 on July 2, 1914.

Initial Dividend of the Municipal Service Company.—An initial quarterly dividend of 1 per cent has been declared on the outstanding $481,000 common stock of the Municipal Service Company, which was incorporated in 1912 as a consolidation of the Chester Valley Electric Company, the Staunton Lighting Company, the Sumter Lighting Company and the Alexandria County Lighting Company. The Baker, Ayling & Company interests, of Boston and Philadelphia, control the Municipal Service Company.

Westinghouse Electric Company Matters.—To fill the vacancies in the board of directors of the Westinghouse Electric & Manufacturing Company left by the resignation some time ago of T. W. Lamont and the recent death of George Westinghouse, the election of J. N. Wallace, president of the Central Trust Company, and of H. H. Westinghouse has been announced. The report of the Westinghouse company for the fiscal year ended March 31, 1914, is in preparation and will be published early in May. It is expected that this report will show record figures in connection with the 1913 business.

Operations of Northern States Power Company.—The Northern States Power Company, of Chicago, is one of the three large holding companies of H. M. Byllesby & Company. The annual report of President Byllesby, dated Feb. 14, 1914, to which brief reference was made in the *Electrical World* of March 21, is an unusually complete and explicit document and contains considerable information of general interest. The company owns the Consumers' Power Company of Minnesota, which, in turn, controls the Minneapolis General Electric Company and other properties. Public utilities, mainly electrical, are operated in Minneapolis, St. Paul, Stillwater, Mankato, Faribault and other communities in Minnesota; Galena, Ill., and Fargo, Grand Forks and Minot, N. D. The company also serves a few small communities in Wisconsin. It operates several water-power plants, the largest being at Taylor's Falls, 40 miles northeast of Minneapolis. This plant is rated at 25,200 hp. The next largest water-power plant in the system is at the Main Street station at St. Anthony's Falls in the heart of Minneapolis. This is rated at 3400 hp. The water-power plant at Rapidan, Minn., is of 2200 hp and that at Cannon Falls, Minn., 1800 hp. At Coon Rapids, on the Mississippi River, about 6 miles above the limits of Minneapolis, the company, through the Northern Mississippi River Power Company, is completing a rather extensive hydroelectric development. Here there are to be five generating units of over 10,000 hp in total rating. It is expected that this plant will be in full operation not long after Sept. 1 of this year. Within a year's time it is the purpose of the company to complete connection by transmission lines of the water-power plants at Rapidan, Cannon Falls, Taylor's Falls, Coon Rapids, Somerset, Wis., and Riverdale, Wis. These stations will be connected with one another and also with the large steam reserve generating plants in St. Paul and Minneapolis. When these tie lines are completed it is altogether probable that a number of the smaller

steam plants in the system will be shut down for normal operation. Furthermore, the connection will enable the transference from one hydroelectric station to another of any surplus of available energy. It is believed that, including the rural and farming population served, the total population contiguous to the circuits of the company is about 765,000. The number of electric-service customers connected with the system on Dec. 31, 1913, was 45,518.

California-Idaho Company Bonds Called For.—The reorganization committee of the California-Idaho Company has issued a call to the holders of first and collateral trust bonds of that company for the deposit of the same on or before May 1. Under the reorganization agreement these bonds will be replaced by collateral trust bonds of the American Water Works & Electric Company. The California-Idaho Company is the only irrigation property to be taken over by the latter concern.

Annual Report of the Canadian General Electric Company.—Gross profits of $2,029,898 were shown in the annual report of the Canadian General Electric Company for the year ended Dec. 31, 1913, and, after deducting interest and depreciation of $693,588, dividends of $776,634 and reserve of $328,134, a surplus of $231,542 was obtained for the same period. Its total surplus and reserve on the above date was $3,613,933. The company is capitalized at $10,000,000, of which $8,000,000 is common and the rest preferred stock. Total liabilities on Dec. 31, 1913, came to $22,425,774. In the *Electrical World* for May 3, 1913, a note appeared on the formation of the Canadian Allis-Chalmers Company, Ltd., which took over the Allis-Chalmers-Bullock Company, Ltd. The first mentioned of these companies was later merged with the Canada Foundry Company, Ltd., another concern controlled by the Canadian General Electric Company. The report states that during 1913 collections were very satisfactory and that the volume of business, while a little decreased toward the end of the year, was much better than had been anticipated. No material shrinkage of business has been noticed by this company. The deaths of James Ross and George A. Cox, both long connected with the company, left two vacancies in the board of directors in 1913, which places were filled by the election to that board of J. K. L. Ross and E. W. Cox, sons respectively of the deceased directors.

Marconi Company's Report for 1913.—The report of the Marconi Wireless Telegraph Company of America for the eleven months ended Dec. 31, 1913, showed a net profit of $178,251. On Aug. 1, 1913, a dividend of 2 per cent was paid on the outstanding stock of $9,402,070. The total assets of the company are given as $9,919,947. In the *Electrical World* for Feb. 8, 1913, note was made of the letting of contracts for the erection of eight long-distance stations by the Marconi company, four of which were to serve for transatlantic and four for transpacific communication. The report states that the erection work on these stations is progressing satisfactorily and that they are expected to be completed and in operation early in the present summer. It is hoped to start operations between the Pacific Coast stations and those in Honolulu prior to June 1. A high power station is under construction in Japan and will eventually connect that empire with the United States, through the station at Honolulu. Land has been purchased at Chatham and at Marion, Mass., as sites for a transmitting and a receiving station to connect this country with Norway, the station in that country being now under construction. Arrangements have been completed with the Western Union Telegraph Company whereby its system of land telegraph lines is to be connected with the Marconi stations in different sections of the country, so that wireless messages may be sent from any place where there is a telegraph office. The Marconi company is planning also to build high power stations at Ketchikan and Juneau, Alaska, to handle the commercial messages between those points and the stations at Seattle and Astoria, Wash. During the year 1913 an innovation in wireless application was tried out in the equipping of trains on the Delaware, Lackawanna & Western Railroad with wireless outfits, by which constant communication was maintained between moving trains and the offices of that road between New York City and Buffalo, N. Y. Description of this service appeared in the Jan. 10, 1914, issue of the *Electrical World*.

Business Notes

The H. W. Johns-Manville Company, of New York, has appointed F. B. Smith as assistant to T. F. Manville, president of the company.

The Weston Electrical Instrument Company has secured the services of Edwin Wortham as its district representative for the territory including the States of Virginia, West Virginia and North Carolina. His office will be at Suite 38, Allison Building, Richmond, Va.

The Goulds Manufacturing Company, of Seneca Falls, N. Y., has appointed H. F. Miller as its advertising manager. Mr. Miller has been associated with the advertising department of the Otis Elevator Company for the past year, and for four years previous to that he was with the Western Electric Company.

Belknap Hardware & Manufacturing Company.—Mr. O. Sacksteder, Jr., who for several years was in charge of the shipping department of the James C. Clark, Jr., Electric Company, of Louisville, Ky., is now sales manager of the electrical department of the Belknap Hardware & Manufacturing Company, of the same city.

The San Diego Gas & Electric Appliance Company has been formed with offices and showrooms at 939 Sixth Street, San Diego, Cal. The business of the company will be the installation and maintenance of complete gas and electric equipment in all classes of buildings, and a special feature of the work will be the maintenance of appliances on a regular monthly basis. Thurston Owens is secretary and general manager of this company.

The McGraw Company is the name of the new concern formed by consolidating the Interstate Electric & Manufacturing Company of Sioux City, Ia., and the J. R. Lehmer Company, of Omaha, Neb. For some time the two companies have been owned and operated by the same interests so that no important changes will accompany the consolidation. Max McGraw is president of the new corporation, and M. F. Van Kuren and C. A. Fried are its vice-presidents.

The Main Electric Manufacturing Company, of 219-21 South Beatty Street, Pittsburgh, Pa., has been incorporated under the laws of Delaware, with a capital of $100,000, to engage in the business of manufacturing and selling electric light and power plants of from ½-kw to 12-kw rating. These small generating sets, including storage-battery equipment, are to be sold for service in country residences and will be handled through dealers in various territories. Murray E. Main is president of the concern.

The Norma Company of America, 20 Vesey Street, New York, has secured the services of O. P. Wilson as assistant general manager. Mr. Wilson has been connected with the purchasing department of the Westinghouse Electric & Manufacturing Company for fourteen years and for ten years past has been one of its head buyers. The Norma company manufactures and imports high-grade ball bearings, roller bearings and precision instruments. On April 11 this company will move its offices from the above address to 1790 Broadway, New York City.

The Independent Electric Manufacturing Company, of Milwaukee, manufacturer of alternating-current and direct-current controlling devices, announces that it has obtained the services of Mr. H. L. Van Valkenburg, who will have charge of its engineering department. Mr. Van Valkenburg has been connected with the Westinghouse, Allis-Chalmers and Walker Electric companies and has developed a number of devices. At the present time he is giving his attention to a number of new types of apparatus which the Independent company will shortly put on the market.

Charles E. Knox, of 101 Park Avenue, New York, has been retained by the Equitable Office Building Association as consulting engineer in connection with the elevator installation in the new Equitable Building in New York. Mr. Knox designed and supervised the elevator installations in the Woolworth and the Municipal Buildings, and the Equitable Building system will be larger than either of these. Six groups, of eight elevators each, will be installed, giving a total of 20,240 ft. of single shaft, feeding to approximately 45 acres of floor area, which will accommodate 15,000 people, when normally occupied.

The Electric Service Sales is the name of an enterprise just started with headquarters at 17 North Wabash Building, Chicago, Ill. This company will act as agent for the purchasing and sale of everything electrical.

H. M. Byllesby & Company will remove their general offices on April 20 from the Insurance Exchange to the nineteenth floor of the new Continental and Commercial Bank Building, at the southwest corner of South LaSalle Street and West Adams Street, Chicago.

The Pennsylvania Indicator Company, of Erie, Pa., has been incorporated for the purpose of manufacturing and selling street and station indicators for electric and steam railway cars. The device consists of a sign which automatically indicates the streets and stations as these are approached and at the same time provides a method for calling advertising signs to the attention of the passengers. The United Sales Agency is managing the sales end of this enterprise. W. D. Nixon is president of the new company, G. C. Jones vice-president and secretary, and G. D. Giddings treasurer. R. R. Gessford, mechanical engineer for the company, was formerly connected with the Niagara Falls Power Company and is now with the Niagara Searchlight Company.

New Industrial Companies

The Clifton Electro-Chemical Company, of Boston, Mass., has been incorporated with a capital stock of $40,000 by H. S. Riley, of Woburn, Mass.; M. S. Clawson, of Weehawken, N. J., and T. M. Smith, of Braintree, Mass.

The Electric Automatic Railway Cab Signal Company, of Chicago, Ill., has been incorporated with a capital stock of $300,000 by J. H. Jacob, P. C. Vaughan and A. G. F. Schue. The company proposes to manufacture railway equipment.

The Electric Products Company, of Cleveland, Ohio, has been granted a charter with a capital stock of $1,000 to manufacture and deal in electrical supplies. The incorporators are William Rodewell, Joseph F. Meyer, George S. Meyers, V. C. Birchall and T. H. Ball.

The Munsungun Manufacturing Company, of Presque Isle, Maine, has been incorporated with a capital stock of $1,000,000 to manufacture and deal in all kinds of electrical and mechanical devices. Freemont E. Bennett is president and Asa A. Bishop, treasurer.

The Utilities Improvement Company, of New York, N. Y., has been granted a charter with a capital stock of $100,000 to construct gas, electric light, heat, power plants, waterworks, etc. The incorporators are H. H. Hance, H. R. Frost and M. Korff, of New York, N. Y.

The Electric Dish Washer Company, of Buffalo, N. Y., has been incorporated with a capital stock of $100,000 by Eugene Carey, 58 Gluck Building, Niagara Falls, N. Y.; Richard Carey and George W. Hewitt, both of Niagara Falls. The company proposes to manufacture electric dish washers.

The Ahlberg Kerosene Carburetor Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $300,000 to manufacture carburetors; also to do a mechanical and electrical engineering business. The incorporators are H. Davis, P. W. Burke and M. J. Drain, of Pittsburgh, Pa.

The Aladdin Electric Lamp Company, of Dover, Del., has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $2,000,000. The company proposes to manufacture and deal in electric lamps and all kinds of machinery for generating and distributing heat, light and power. The incorporators are F. D. Buch, M. L. Horty and George W. Dillman.

The Automatic Appliance Company, of Portland, Maine, has filed articles of incorporation under the laws of the State of Maine with a capital stock of $200,000. The company proposes to do a general manufacturing business and deal in all kinds of mechanical and electrical machines. E. P. Thompson, of Arlington, Mass., is president, and H. P. Sweetzer, of Portland, treasurer.

Trade Publications

Electrical Supplies.—A net price list and discount sheet applying to its Catalog 21 has just been issued by the Illinois Electrical Company.

Fault Detector.—A folder put out recently by W. N. Matthews & Brother, of St. Louis, Mo., explains why the reader ought to order his Matthews Telefault now.

Wiring Specialties.—The Fancleve Specialty Company, of Jamaica Plain, Mass., has issued a bulletin covering its wiring supplies of various kinds. Prices and descriptions are given of these specialties.

Dynamic Braking Controllers.—Form H dynamic braking dinkey controllers for direct-current motors are described in Bulletin 1038, just issued by the Electric Controller & Manufacturing Company, of Cleveland, Ohio.

Starting Switch.—Bulletin B-54 issued by the Allen-Bradley Company, Milwaukee, Wis., refers to type H resistance starting switch for alternating-current induction motors. This device is fully described and illustrated.

Toaster Stove.—The American Electrical Heater Company, Detroit, Mich., has issued a large poster illustrating its "Tringle" electric iron and showing some samples of newspaper advertisements. Electros of these advertisements are offered dealers in connection with local publicity.

Electrical Apparatus.—"A Westinghouse Electric Device for Every Need" is the title of a pamphlet recently issued by the Westinghouse Electric & Manufacturing Company, covering the application of electrical apparatus to home, office, store, garage, farm and other industrial work.

Electrical Tools.—Bulletins E-31 and E-32, just issued by the Chicago Pneumatic Tool Company, treat of the Duntley electrical drills, grinders and spike drivers for railway work and the Duntley drilling stand, by which the portable tool can be turned into a stationary vertical drill for sensitive work.

Lamp Prices.—The Franklin Electric Manufacturing Company, Hartford, Conn., has issued a post card, size 5.5 in. by 8.5 in., which contains the new prices, effective April 1, 1914, of Franklin tungsten-filament lamps, in sizes from 10 watts to 250 watts. An illustration of a 25-watt Franklin lamp with an unskirted base, 100-130 volts, is given.

Tips and Terminals.—A twelve-page booklet has been issued by the Belden Manufacturing Company, Twenty-third Street and Western Avenue, Chicago, Ill., which illustrates and briefly describes its large variety of clips, tips and terminals. Telephone cores, connectors and pigtails are also referred to. The booklet is known as Bulletin No. 1003.

Counting and Weighing Machines.—The National Scale Company, of Chicopee Falls, Mass., has issued a catalog explaining its counting and weighing machines and the Chapman elevating truck for quick handling of heavy factory loads. A number of good illustrations are given of the above apparatus, supplementing the descriptive matter.

Directly Connected Exhaust Fans.—Bulletin 3508 of the Emerson Electric Manufacturing Company, St. Louis, Mo., has just been issued, giving information on various questions connected with the design, operation, dimensions and prices of that company's directly connected exhaust fans and ventilating fan motors, for both alternating and direct current.

Spectacles.—The American Spectacle Company, of 27-29 West Twenty-third Street, New York, has recently sent out a return postal folder, advocating its spectacles for accident prevention. Among the electrical concerns mentioned as users of its product are the General Electric Company, the National Brake & Electric Company, and the Cutler Hammer Manufacturing Company.

Electrical Machinery and Appliances.—The Barber-Dwinnell Electric & Manufacturing Company, of Kansas City, Mo., has just issued a price list on electrical machinery and apparatus of various kinds. The special features of this publication are that discounts have been figured out and that freight rates are also taken care of, the prices given being net to the trade and in most cases f.o.b. cars Kansas City.

Personal Mention

Mr. Frank J. Duffy, manager of the Southern Railway & Light Company, Natchez, Miss., has also been elected president of the company.

Mr. John E. Sweeney has resigned from the sales department of the Westinghouse Electric & Manufacturing Company to become secretary-treasurer of the Waterloo (Ia.) Electric Supply Company.

Mr. W. P. Naser, formerly covering territory east of the Mississippi River for the Trumbull Electric Manufacturing Company, has been transferred to Northern and Western territory, with headquarters in Chicago.

Mr. W. R. Abbott has been promoted to be general manager of the Chicago Telephone Company, succeeding Mr. H. F. Hill, promoted to the vice-presidency. Mr. Abbott was until recently general commercial superintendent of the company. He is one of the most popular men on the company's staff.

Mr. John A. Britton, vice-president of the Pacific Gas & Electric Company, San Francisco, Cal., has been reappointed a member of the board of regents of the University of California for the full term of sixteen years. In making the reappointment Governor Johnson paid an appreciative tribute to Mr. Britton's past services and devotion to the university.

Mr. L. Bartlett, construction engineer for the Doherty electric-service property at Elyria, Ohio, now operating under the name of "R. E. Burger, agent," has gone to Denver to assist in redesigning the switching equipment in the station of the Denver Gas & Electric Light Company. Mr. Bartlett later expects to continue his trip to his home in southern California.

Mr. H. L. Van Valkenburg has been appointed head of the engineering department of the Independent Electric Manufacturing Company, Milwaukee, Wis. Mr. Van Valkenburg was formerly in charge of rheostat design for the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., later with the detail apparatus department of the Allis-Chalmers Company, Milwaukee, and recently chief engineer of the Walker Manufacturing Company, Philadelphia, Pa.

Mr. Martin J. Wolf, Chicago sales manager for the Hotpoint Electric Heating Company, has resigned to accept the position of jobbing sales manager for W. N. Matthews & Brother, of St. Louis, and expects to remove to that city on April 15. Mr. Wolf was formerly connected with the Hobson Electric Company, of Dallas, Tex. He has been a member of the Chicago electrical contingent a comparatively short time, but was becoming well known and well liked. He is a statesman-at-large of the Jovian Order.

Mr. O. G. Draper has joined the sales staff of the Buffalo Electric Vehicle Company, with headquarters at the Boston office. Mr. Draper has been an active supporter of the electric vehicle since the beginning of the Boston campaign and was business secretary of the Electric Motor Car Club of Boston prior to entering the commercial field in person. He was assistant automobile editor of the Boston *Herald* before becoming connected with the Electric Motor Car Club and joined the latter because of his enthusiastic belief in the future of the electric vehicle.

Mr. P. J. Kearny has been appointed electrical engineer of the New York, New Haven & Hartford Railroad, New Haven, Conn., reporting to Mr. W. S. Murray, consulting engineer, with duties as assigned. Mr. Kearny was graduated from the Massachusetts Institute of Technology in mechanical engineering in 1903. In 1904 he took postgraduate work in electrical engineering at that institute. He next served as an engineering apprentice with the Westinghouse Electric & Manufacturing Company. In 1906 he was appointed assistant to the electrical engineer of the New York, New Haven & Hartford Railroad and in 1910 was appointed engineer of electric traction on the New York, Westchester & Boston Railway electrification. Since 1913 he has been with the firm of McHenry & Murray, of New Haven, Conn., acting as consultant to the New York, New Haven & Hartford Railroad.

Mr. Austin C. Dunham, of Hartford, Conn., for many years president of the Hartford Electric Light Company and a pioneer in central-station development, has just published a noteworthy little volume of "Reminiscences." Although the reader will find few comments upon electrical matters in the book beyond brief references to the development of the steam turbine as a factor in central-station production and to the erection of the Dunham Electrical Laboratory at Yale University, admirers of the venerable leader whose retirement was chronicled in the *Electrical World* of Feb. 17, 1912, will discover that it throws much light upon his personal outlook upon life and includes many carefully considered views of the economic problems of the age. Mr. Dunham is at present sojourning at Cardenas, Cuba, in company with Major J. W. Cheney, of South Manchester, Conn., and with an entourage including his two Japanese servants, a reader and a chauffeur. He expects to return to Hartford about April 15, and will probably devote much attention this summer to the application of electricity to small farming.

Mr. Robert E. Brown, the new president of the Minnesota Electrical Association, is the manager at Mankato, Minn., for the Consumers' Power Company. Mr. Brown has been connected with public utilities in Mankato for a number of years. He took charge of the local gas company in 1887. Two years later this company purchased the local electric-service company, of which Mr. Brown was made manager. In 1910 the property was purchased by H. M. Byllesby & Company. A hydroelectric plant rated at about 2500 hp was built near Mankato. Another was constructed at Cannon Falls. These two furnish electrical energy for some fourteen towns and cities in southern Minnesota. Mr. Brown has been a member of the executive board of the Minnesota Electrical Association since that body was organized six years ago. He is the president of the Mankato Automobile Association and is a member of the National Electric Light Association and the American Gas Association. The Consumers' company in Mankato operates both gas and electric-service properties and sells energy to the street-railway company. It has a steam plant which is operated in conjunction with the hydroelectric development.

ROBERT E. BROWN

Obituary

W. A. Dutton, one of the founders of the Van Dorn & Dutton Company, Cleveland, Ohio, builder of electric drills, gears and pinions, died in St. Augustine, Fla., on March 21.

Byron L. Smith, president of the Northern Trust Company Bank and a prominent financier of Chicago, died on March 22. Mr. Smith was interested in electrical development. He was a director and a member of the executive committee of the Commonwealth Edison Company, and also a director of the Chicago Telephone Company

Herman C. Tafel, a well-known electrical supply man of Louisville, Ky., died suddenly two weeks ago of heart failure. Mr. Tafel was a native of Scott County, Ky., where he was born in 1860. He had been engaged in the electrical supply business in Louisville for ten years. The H. C. Tafel Electric Company, which has filed articles of incorporation with a capital stock of $75,000, succeeds to the business.

Henry G. Patterson, of some prominence in the electrical industry in the early days, dropped dead in Decatur, Ill., on March 13. Mr. Patterson was connected with the old Thomson-Houston Electric Company of twenty-five years ago, serving both at the Lynn works and in the Chicago office. He was later superintendent of the mnuicipal electric-light and water-works plant in Austin, Tex., at the time that it was put out of commission by a flood in the Colorado River. For a time Mr. Patterson was engaged in non-electrical pursuits, but more recently he had been connected with the Illinois Traction System.

Construction

New England

SKOWHEGAN, MAINE.—The Somerset Trac. Co., of Skowhegan, has recently purchased a site on the Madison Road, just beyond Lakewood, on which it proposes to erect a new substation, 30 ft. by 32 ft. The station will have an output of 300 kw. Electricity for this substation will be secured from the transmission line of the Central Maine Pwr. Co., of Waterville, at 33,000 volts. Equipment for station has been purchased.

EASTHAMPTON, MASS.—We are informed that the Easthampton El. Lt. Co. does not contemplate any extensions or improvements during the coming year. Reported in the March 28 issue to have been granted permission to issue $10,500 in bonds, the proceeds to be used for improvements to lighting system. John N. Lyman is secretary and superintendent.

SPRINGFIELD, MASS.—The United El. Lt. Co., of Springfield, is planning to lay about 5 miles of underground conduits, work on which will begin about April 15. W. L. Mulligan is manager.

Middle Atlantic

BROOKLYN, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, corner of Park Avenue and Fifty-ninth Street, New York, until April 6 for installing electric equipment in new Public School 14, corner of Fairview and Hillside Avenues, Corona Heights, borough of Queens; also for installing electric equipment in Richmond Hill High School, Richmond Hill, borough of Queens. Blank forms, plans and specifications may be obtained or seen at the office of the superintendent, Park Avenue and Fifty-ninth Street, Manhattan, and also at branch office, 69 Broadway, Flushing, borough of Queens.

JAMESTOWN, N. Y.—The city of Jamestown expects to build an addition to the boiler house of the municipal electric-light plant, bids for which will be opened about April 1. The city will also purchase one 1000-kw turbine generator, bids for which will be opened April 16; also condenser and switchboard complete for above generator. One 200-hp return-tubular boiler and two stokers have already been purchased. Clayton O. Johnson is manager.

MORRISTOWN, N. Y.—The Gregory El. Co. expects to purchase material for distribution and lighting systems, lamps and electrical appliances and supplies to meet current needs. J. M. Gregory is manager.

RIVERHEAD, N. Y.—The Riverhead El. Lt. Co. expects to install within the next three months a 200-hp Babcock & Wilcox water-tube boiler (175 lb. pressure). Robert P. Griffing is treasurer.

SODUS, N. Y.—The Sodus Gas & El. Lt. Co. expects to purchase pole-line equipment, hardware, insulators, etc., for 110/220-volt work to meet current demands. G. R. Mills is general manager.

CATAWISSA, PA.—The proposal to sell the municipal electric-light plant was defeated at an election held recently, also the proposition to issue $8,500 in bonds for improvements to the plant. The Columbia & Montour El. Co., of Bloomsburg, has submitted a proposal to sell electricity generated at the Harwood plant to the borough, and this will be considered by the Borough Council.

DILLSBURG, PA.—The Dillsburg Lt., Ht. & Pwr. Co. expects to purchase some meters within the next six months.

FARRELL, PA.—The contract for electric wiring and fixtures for the new school building has been awarded to the Shenango Valley El. Lt. Co., of Sharon.

NEW CASTLE, PA.—An ordinance has been introduced into the City Council to grant the New Castle El. Co. a franchise to furnish electricity for street and commercial lighting for a period of ten years. It also gives the company permission to erect transmission lines from its plant in this city as may be necessary to transmit energy from the plant in Lowellville and from the hydroelectric plant of the Pennsylvania Wtr. Co. at Ellwood City. The ordinance provides for the use of 300-watt arc lamps, the lamps to be installed within six months after the contract takes effect. The company also agrees to place its wires in underground conduits to be owned by the company if the city will allow or will place them in the municipal conduit within a year after the notice is given.

PHILADELPHIA, PA.—Bids are being received by the committee on property of the board of education, Room 292, City Hall, Philadelphia, for electrical equipment for a number of schools in the city.

PHILADELPHIA, PA.—Plans are being prepared by John T. Windrim, architect, of Philadelphia, for the erection of a large substation at Germantown Avenue and Moreland Street for the Philadelphia El. Co.

ATLANTIC CITY, N. J.—Bids will be received by the board of chosen freeholders of Atlantic County, Memorial Hall, Atlantic City, N. J., until April 8 for lighting the county road from Atlantic City to Pleasantville, known as the Meadow Boulevard, for a period of five years. Bids are to be submitted for furnishing and maintaining 57 electric arc lamps of 1200 cp, to be installed at or near the locations of the present lamps. Specifications are on file in the office of A. H. Nelson, county engineer, Bartlett Building, Atlantic City, N. J.

MANASQUAN, N. J.—Plans are being considered by the Council to replace the gas-lighting system with electric lamps. If the present scheme is carried out, 100 electric incandescent lamps will replace the 85 gas lamps now in use. The Point Pleasant El. Lt. & Pwr. Co., of Point Pleasant, furnishes electrical service in Manasquan.

MILLVILLE, N. J.—The City Commission has decided to renew the fight started two years ago for a municipal electric-lighting system and to issue bonds for same.

NEWARK, N. J.—The Public Service El. Co., of Newark, has applied to the Board of Freeholders for permission to install underground conduits in Bloomfield Avenue, Glen Ridge, and in Central Avenue, Orange and East Orange.

NEWARK, N. J.—Bids will be received by the Board of Freeholders until April 15, in connection with general construction bids, for electric-lighting and power work and heating and ventilating work in the new tuberculosis hospital at Overbrook. Plans and specifications may be seen at the office of John F. Capen, 207 Market Street, Newark.

FREDERICK, MD.—The installation of an ornamental street-lighting system in the business district is under consideration.

ELKINS, W. VA.—The Elkins Pwr. Co. may, during the summer, change from natral gas to coal for fuel and use stokers for firing. C. C. Bosworth is superintendent.

WILLIAMSON, W. VA.—Within the next 30 days the Williamson Lt. & Ice Co. expects to purchase brackets, etc., to add 75 series incandescent lamps to the street-lighting system. O. B. Welch is vice-president.

COEBURN, VA.—The Coeburn Lt. & Pwr. Co. expects to purchase within the next 30 days one 5-kw transformer, one 5-amp, one 10-amp, one 15-amp and one 50-amp ammeter and 2000 ft. weather-proof wire. Claude H. Cox is manager.

MANASSAS, VA.—The validity of the $75,000 bond issue of the town of Manassas, authorized for the purpose of installing an electric-light plant, water-works and sewerage systems, has been upheld by a decision handed down by Judge L. C. Barley in the Circuit Court at Alexandria.

WASHINGTON, D. C.—An American consulate writes that a business man desires to be placed in communication with American manufacturers of electric cables and electric tape. For further information address No. 12,791, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or the branch office, Room 337, United States Custom House, New York, N. Y.

WASHINGTON, D. C.—Bids will be received at the office of the Commissioners of the District of Columbia, Room 509, District Building, Washington, D. C., until April 6 for furnishing cast-iron lamp-posts for use in the electrical department. Specifications and form of proposal may be obtained from the purchasing officer, District of Columbia, Room 320, District Building, Washington, D. C.

WASHINGTON, D. C.—The American consul at Madrid reports that bids are requested for supplying and installing two wireless telegraph stations in Spain. Bids must be submitted through a local agent. A list of these agents can be obtained by addressing No. 12,719, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., and at the branch offices, 315 Custom House, New York, N. Y.; 629 Federal Building, Chicago, Ill.; Association of Commerce Building, New Orleans, La., and 310 Custom House, San Francisco, Cal.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 14 for 1090 lb. copper tubing to be delivered at Brooklyn, N. Y., under Schedule 6588. Bids will also be received until April 21 for delivering at the various navy yards and naval stations supplies as follows: Brooklyn, N. Y., Schedule 6585—4000 ft. phosphor bronze cable, 3100 lb. No. 10 copper wire, 250 ft. strip copper (6-in. by 1/32 in.). Schedule 6595—50,000 ft. double-conductor telephone cable, 2000 ft. plain single-conductor wire; Schedule 6573—four exhaust electric fans; Schedule 6591—2800 ft. plow-steel wire rope; Schedule 6859—2900 lb. weather-proof wire; Schedule 6596-3360 lb. soft sheet brass, 1500 lb. soft sheet copper, 8000 lb. brass pipe, 3000 lb. brass tubing; Schedule 6577—9350 lb. 1 15/16 in. rolled bronze. Portsmouth, N. H., Schedule 6578—one 1-ton traveling crane, two hand-hoist trolleys. Newport, R. I., Schedule 6577—12 1½-ton trolley hoists, 300 lb. copper tubing, 157 air-pressure gages. Norfolk, Va., Schedule 6584—1440 ft. crucible steel-wire rope. Charleston, S. C., Schedule 6585—20,000 lb. condenser tubes. Applications for schedules should give the schedule desired by number. T. J. Cowie is paymaster general, U. S. N.

North Central

DETROIT, MICH.—The Murphy Pwr. Co. is planning to erect a new power plant to replace the one at the corner of Wayne and Congress Streets.

DETROIT, MICH.—The Detroit Edison Co. is reported to have awarded the contract for the construction of its new power station, to be erected at the foot of Lycaste Street.

DETROIT, MICH.—The Common Council on March 24 allowed an appropriation of $5,000 for the erection of tungsten lamps in the alleys and at dark intersections. Lamps will also be erected in the district around the municipal buildings.

DETROIT, MICH.—Bids will be received by Charles A. Gadd, secretary Board of Education, Detroit, until April 20, for electric wiring in connection with the new Albert McMichael High School, to be erected in the northeastern part of the city.

KALAMAZOO, MICH.—The City Council, it is reported, has rejected all bids for equipment of the old municipal electric-light plant.

ORCHARD LAKE, MICH.—The John D. Templeton Co., of Detroit, has secured the contract for installing electrical equipment, including motors for the new dairy farm, owned by James Couzens, near Orchard Lake.

SAULT STE. MARIE, MICH.—The Edison Sault El. Co., of Sault Ste. Marie, is planning to extend its service to include Brimley, Rudyard, Dafter, Pickford and Cedarville, where the company has already procured franchises.

ARCADIA, OHIO.—The Arcadia El. Lt. Co. expects to purchase one boiler, a generator, switches, lightning arresters, insulators, wire, incandescent lamps, posts, supplies, switches, etc. P. A. Wheland is owner.

ARCHBOLD,, OHIO.—The Archbold El. Lt. & Pwr. Co. expects to change its system from 220 volts, direct current, to 220 volts, 60 cycles, alternating current, in the near future. R. S. Rodenhuis is manager.

CAMBRIDGE, OHIO.—Within the next six months the New Midland Pwr. & Trac. Co., of Cambridge, expects to erect a 33,000-volt transmission line from Newcomerstown to Cambridge, with necessary substations, etc. The company may possibly make other small extensions. W. S. Hays is superintendent.

ELMORE, OHIO.—The town of Elmore has purchased two 25-kw transformers, necessary switchboard equipment and other apparatus to change the municipal electric-light plant to three-phase system. No other work is contemplated this year. F. H. Williams is clerk.

FREEPORT, OHIO.—Bids will be received by the village of Freeport (Prairie Depot), Wood County, until April 16, for furnishing electricity for lighting the streets, alleys, public ways and municipal buildings. H. E. West is clerk of the Freeport Corporation.

KENTON, OHIO.—The Hardin-Wyandot Ltg. Co., of Kenton, has changed its system from 125 cycles to three-phase, 60 cycles. New generators have been installed and a new 500-kw turbine is now being installed. All necessary equipment has been purchased. An item published in the issue of March 28 stated that the company was planning to install a new 500-kw turbine with entire new condensing outfit.

LONDON, OHIO.—The engineer engaged by the City Council to make investigation of the municipal electric-light plant estimates that it requires an expenditure of $10,000 to $15,000 to put the plant in good condition. He recommends that the city make the improvements required rather than purchase energy from the Ohio El. Ry. Co.

NEWARK, OHIO.—The Ohio Lt. & Pwr. Co., Newark, it is reported, is securing the right-of-way for a high-tension transmission line between this city and Shawnee.

PAULDING, OHIO.—The Municipal Electric Light and Power Department would like to receive information on coal conveyors. L. O. Farnsworth is superintendent.

PLEASANT HILL, OHIO. — Arrangements are being made by the business men of Pleasant Hill for the installation of an electric-light plant here. Among the promoters are Jesse Beery, Frank Longnaker, John Myers and others.

PROSPECT, OHIO.—The Prospect El. Lt. & Pwr. Co. recently changed its system from 133 cycles to 60 cycles. R. C. Oswald, of Marion, is secretary and treasurer.

WELLINGTON, OHIO.—The town of Wellington may possibly install a 75-hp to 100-hp gas engine in the municipal electric-light plant to carry the light load. A. R. Branson is clerk.

WEST LIBERTY, OHIO.—The local electric-light plant, owned by C. A. Hartzler, has been purchased by J. W. Tompkins, of Fort Wayne, Ind. The new owner, it is understood, contemplates improvements and changes to the system.

WEST MILTON, OHIO.—L. A. Pearson, owner of the Stillwater Valley electric-light plant, expects to erect about 5 miles of transmission line to neighboring villages and to purchase material for same within the next six months; also to purchase within the next 30 days 38 series street tungsten lamps, 100-cp, 2300-volt, 6.6-amp, to take the place of the present arc lamps.

YOUNGSTOWN, OHIO.—The Petroleum Iron Works Co., of Youngstown, is building an extension to its power plant to provide for the installation of compressors.

LEXINGTON, KY.—The College of Civil Engineering of the State University of Kentucky, Lexington, Ky., is preparing to install a road laboratory, which will include a standard abrasion cylinder, a ball-grinding machine, a diamond-core drill saw, a standard grinding saw and other electric-motor driven equ pment.

LOUISVILLE, KY.—The Louisville Grocery Co. is planning to install electric elevators and other equipment and improvements in its five-story building on Main Street, recently purchased.

LOUISVILLE, KY.—Plans are being considered by Samuel D. Jones, business director for the board of education of Louisville, for installing electric lamps in all of the schools in the city and to make other improvements during the summer.

ANDERSON, IND.—The Board of Public Works is considering the proposition of installing an ornamental lighting system in the business district. Both tungsten cluster lamps and magnetite lamps are under consideration. Ornamental standards will be provided, which will be maintained by underground wires. It is reported that $20,000 will be appropriated for this improvement.

INDIANAPOLIS, IND.—Bids will be received by the Board of Public Works until April 20 for the street-lighting for a period of ten years, to date from the expiration of the present contract, which expires April 1, 1915.

INDIANAPOLIS, IND.—The Board of Park Commissioners is considering the question of substituting electric lamps for the gas and gasoline lamps now in use in the city parks. The proposed new system may be extended to the boulevards. For further information address B. J. T. Jeup, city engineer.

CHICAGO, ILL.—Bids will be received by the city of Chicago, Room 406, City Hall, Chicago, for furnishing one 200-kw motor-generator set to operate under 60 cycle, three-phase, 440 volts, alternating current, and deliver at 220 volts, direct current, at the municipal reduction plant of the city of Chicago, situated at Thirty-ninth and Iron Streets, according to plans and specifications on file in the office of the Department of Public Works, Room 406, City Hall. George B. Young is commissioner of health.

DONOVAN, ILL.—The installation of a municipal electric-light plant in Donovan is under consideration. J. W. Nelson is president of the board.

ELGIN, ILL.—Preparations are being made to begin work on improvements to be made to the Elgin State Hospital, including the erection of a new power plant. Dr. H. J. Gahagan is superintendent.

MORRISON, ILL.—The City Council has awarded a contract to the Illinois Utilities Co., of Chicago for lighting the streets of the city for a period of five years. The contract calls for 134 75-watt tungsten lamps for the residence portion of the city and for five three-lamp clusters in the business district. The contract calls for alternating current instead of direct current, which will necessitate the reconstruction of the entire distribution system in the city and the installation of rubber-insulated wire.

STERLING, ILL.—At an election held March 19 the proposal to install an ornamental street-lighting system was carried. H. B. Green, of Sterling, is engineer in charge.

DODGEVILLE, WIS.—A deal has been consummated whereby the Mineral Point Pub. Ser. Co., of Mineral Point, will take over the property of the Dodgeville El. Lt. & Pwr. Co. for a consideration of $15,857. Power will be generated at the local plant until July 1, when electricity will be transmitted from the plant at Mineral Spring to operate the local system. After July 1 a continuous service will be established.

EDGAR, WIS.—The installation of an electric-light plant in Edgar is reported to be under consideration.

EVANSVILLE, WIS.—Bids will be received by F. W. Gillman, city clerk, until April 17 for construction of addition to power house. This extension is to provide space for the new motor-driven triplex pump which has already been purchased. E. S. Cary is superintendent of municipal light and water plant.

RIPON, WIS.—Within the next three months the Ripon Lt. & Wtr. Co. expects to erect 20 miles of 13,200-volt transmission line and also to purchase one boiler and a generating unit. W. E. Haseltine is general manager.

SHEBOYGAN, WIS.—The Sheboygan Ry. & El. Co. is planning to rebuild its line between Sheboygan and Sheboygan Falls, at a cost of about $20,000.

TOMAHAWK, WIS.—Extensive improvements are contemplated to the lighting and power service of the Tomahawk Lt., Tel. & Improvement Co., which will include the installation of a 200-hp Skinner engine directly connected to a dynamo, and a 150-hp boiler with new smokestack at the downtown auxiliary plant. The boiler installation will call for remodeling and enlarging the boiler house. The water-power plant on the Tomahawk River will be remodeled and a new generator installed. Orders have already been placed for machinery. Victor E. Extrom is manager.

BAGLEY, MINN.—The municipal electric-light plant was recently destroyed by fire.

COMFREY, MINN.—Bonds to the amount of $8,000 have been voted for the installation of a municipal electric-light plant.

GRANITE FALLS, MINN.—A company, it is reported, has been organized by farmers of Stony Run to operate an electric-light system. It is proposed to extend a transmission line from Granite Falls. L. C. Rosetter is chairman and S. O. Tjosvold is secretary.

LAKE PARK, MINN.—The installation of a municipal electric-light plant in Lake Park is under consideration.

MONTEVIDEO, MINN.—The Montevideo El. Lt. & Pwr. Co. expects to erect within the next six months two substations, 13 miles of transmission lines and distributing system in Clara City; also to purchase within the next four months two water-tube boilers, stokers, coal bunkers and conveyors and equipment for complete steam-generating power plant. E. A. Aspnes is engineer and manager.

RED WING, MINN.—The City Council has passed a resolution appropriating $8,440 for the installation of an arc curb-lighting system.

STAPLES, MINN.—Within the next eight months the Board of Electric Light Commissioners expects to purchase some street-lighting equipment. J. Effinger is superintendent.

SWANVILLE, MINN.—A stock company, it is reported, has been organized for the purpose of securing electricity from the electric plant at Little Falls. Mr. Miekle is interested in the company.

TRAVERSE, MINN.—The question of securing electricity from the municipal electric plant in St. Peter is under consideration by the farmers of Traverse and Lake Prairie Township. F. N. Wilson is superintendent of the St. Peter plant.

WACONIA, MINN.—It is reported that an electric-light system will be installed in the new store building now being erected by Charles Hansen. The proposed plant will be driven by a gasoline engine and will furnish electricity for lamps and motors for several business buildings on Main Street.

CLARINDA, IA.—The property of the Lee El. Co., of Clarinda, is reported to have been purchased by John D Curtis & Co., of New York, N. Y. It is understood that the new owners propose to improve and extend the system, making it the radiating center of a large system. Rufus E. Lee will be retained as local manager.

HARLAN, IA.—The city of Harlan expects to purchase within the next six months one 200-kw generator, engine and switchboard. C. D. Lutton is superintendent of light and water plant.

MUSCATINE, IA.—Bids will be received by the supervisors of Muscatine and Louisa Counties, at the office of the county auditor, Muscatine, until April 14 for a steam-driven drainage pumping plant, complete, consisting of three centrifugal pumps, two of which shall have a capacity of 85,000 gal. per minute each against a maximum static pumping head of 16 ft. Alternate bids are solicited at the same time and place on an electric-driven pumping plant of the same general type. The specifications also permit bids on oil-engine-driven pumping plant. For further information address the Marmon Engineering Co., of Peoria, Ill.

NEVADA, IA.—Arrangements, it is reported, have been made by the Iowa Ry. & Lt. Co., of Cedar Rapids, for the erection of an electric transmission line between Nevada and Maxwell. J. C. Young, of Cedar Rapids, is representative of the company.

OAKLAND, IA.—The power house of the Oakland El. Co., it is reported, will be remodeled.

POMEROY, IA.—The Northern Iowa Pwr. Co., of Humboldt, is reported to have applied for a franchise to erect and operate transmission lines in Calhoun County.

HOLT, MO.—The Town Board, it is reported, is considering a proposal submitted by Kansas City promoters for the installation of an electric-lighting system in Holt.

KEYTESVILLE, MO.—The installation of an electric-lighting sytem in Keytesville is under consideration. A proposal has been submitted by Ira B. Parks, superintendent of the Salisbury municipal plant, to furnish electricity to operate the system here.

LA GRANGE, MO.—Within the next 30 days the city of La Grange expects to purchase a triple plunger power pump (6-in. suction); also to install a water-works system. C. H. Hoskins is engineer of municipal electric-light plant.

MACON, MO.—The town of Macon is considering the question of furnishing electricity in the towns of Calloa and Bevier from the municipal electric-light plant. C. F. Thudium is superintendent of the municipal plant.

MONTGOMERY, MO.—The Montgomery Ice & El. Co. is now installing a new Frick ice machine (20 tons capacity) and will be ready to manufacture ice about April 15. E. H. Algermissen is manager.

POPLAR BLUFF, MO.—At an election held March 20 the proposal to issue $75,000 for the construction of a municipal electric-light plant was carried. The proposed plant, it is understood, will be built adjoining the city water-works.

DICKINSON, N. D.—Hughes & Deiters, owners of the local electric-light plant, are now installing two 72-in. by 18-ft. horizontal tubular boilers in their electric plant.

ABERDEEN, S. D.—Bids will be received by F. W. Raymond, auditor, Aberdeen, until May 11 for furnishing and installing electric-light fixtures in accordance with plans and specifications prepared by George F. Fossum, architect, Aberdeen. Plans may be seen at the office of the architect.

CANTON, S. D.—Within the next 12 months the Sioux Valley Pwr. Co., of Canton, expects to purchase a 150-kw generator and switchboard panel. C. H. Morgan is manager.

RAPID CITY, S. D.—Within the next 30 days the Dakota Pwr. Co. expects to purchase about 45 five-lamp standards for street-lighting in Rapid City. George B. Mansfield is secretary and treasurer.

WOONSOCKET, S. D.—The installation of an electric-light plant in Woonsocket is reported to be under consideration. The present plans provide for furnishing electricity in Wessing Springs, Alpena, Lane, Frostburg and Artesian.

ATKINSON, NEB.—Within the next two months J. Skredla & Sons, of Atkinson, expect to erect about 1 mile of distribution line and to purchase about one carload of 30-ft. (6-in.-top) poles, cross-arms and wire for same.

BLUE RAPIDS, KAN.—The property of the Marshall County Pwr. & Lt. Co., of Blue Rapids, has been purchased by Prof. B. F. Eyer, formerly of the State Agriculture College, and E. A. Wharton. It is understood that the capital stock of the company will be increased from $25,000 to $50,000. Improvements are contemplated to the plant which will include rebuilding power house and installing new generators. A new auxiliary steam plant may possibly be installed. The company now secures its power from the Blue River.

KANSAS CITY, KAN.—It is reported that arrangements have been made whereby the municipal electric-light plant in Kansas City will supply electricity to operate the new interurban line of the Kansas City, Kaw Valley & Western Ry. Co. The railway company, it is understood, will expend about $25,000 for the installation of transformers in the municipal plant.

KIRWIN, KAN.—The City Council has granted the Kirwin El. Lt. & Pwr. Co. a franchise to construct and operate an electric-light plant in Kirwin for a period of 20 years. S. E. Cogswell, H. Brown, H. A. Royce and R. P. Royce are interested in the company.

Southern States

BENSON, N. C.—The Benson El. Lt. Co., recently organized, is installing a 50-hp. electric plant, equipment for which has already been purchased. W. S. Murchison is secretary and treasurer.

BETHEL, N. C.—Bonds to the amount of $5,000 have been voted for the installation of an electric-lighting system in Bethel.

GASTONIA, N. C.—Within the next three or four months the Board of Water and Light Commissioners expects to install a post lighting system in the business section. H. Rutter is superintendent of the municipal electric-light plant.

LILESVILLE, N. C.—The city has awarded a contract to install an electric-light system in Lilesville to Michael & Bivens, of Charlotte. Electricity for operating the system will be purchased from the Yadkin River Pwr. Co., of Rockingham, N. C.

ST. PAULS, N. C.—Within the next 30 days the St. Paul Lt. & Pwr. Co. expects to erect a boiler and engine room; also to purchase within the next two months a small belt-geared water pump for fire protection (a cheap second-hand pump will serve) and about 100 ft. of hose. The company is now installing waterwheel and generator at water-power plant. Opie Odum is secretary and manager.

SOUTHPORT, N. C.—Arrangements are being made by the Southport Lt. & Pwr. Co. for the installation of an ice plant in connection with its electric plant.

WARSAW, N. C.—The Duplin Pwr. Co. is reported to be contemplating the installation of an electric-light plant with an output of about 125 hp. For further information address C. W. Petty, engineer, 848 North Street, Greensboro, N. C.

GREENVILLE, S. C.—The Buncombe Road El. Lt. Co., recently incorporated to erect a transmission line, will secure electricity from the Southern Pwr. Co., of Charlotte. The incorporators are: R. K. Taylor, R. A. League and W. G. McDavid.

GREER, S. C.—Bids will be received by the city of Greer until April 14 for construction of water-works, electric-light plant and sewerage system. J. W. White is clerk.

ROCK HILL, S. C.—The Rock Hill Buggy Co., it is reported, expects to purchase a 150-hp steam turbine and direct-current generator, directly connected.

YEMASSEE, S. C.—The Southern Orchard Co., recently incorporated, is planning to develop 400 acres in Jasper County for raising figs. The company proposes to operate canning factory, ice and electric plants and sawmill. Cost of improvements is estimated at $50,000. J. W. Agey, of Knoxville, Tenn., is president.

BUTLER, GA.—A stock company, it is reported, is being organized for the purpose of developing the water-power at McCant's Mill to supply electricity for lighting in Butler. J. M. Harrison, of Montezuma, Ga., is reported to be interested in the project.

CHICKAMAUGA, GA.—The City Council is reported to have granted a franchise to a company to install and operate an electric-light plant here.

GAINESVILLE, GA.—The Sugar Hill Tel. Co., recently incorporated with a capital stock of $500,000, it is reported, contemplates the construction of a rural telephone system from Gainesville down Athens Road through Tadmore district to lower part of Hall County.

MACON, GA.—We are informed that the Central Georgia Pwr. Co. and the Central Georgia Transmission Co. do not contemplate the installation of aditional generators in the plant at the Butts County dam, as reported in the issue of March 21.

MADISON, GA.—Within the next two months the managers of the municipal electric-light plant expect to purchase one car load of poles. G. W. Hubbard is superintendent.

MILLEDGEVILLE, GA.—The Oconee River Milling Co., of Milledgeville, it is reported, will rebuild its hydroelectric plant, recently destroyed by fire, causing a loss of about $50,000.

COPPERHILL, TENN.—The Home Lt. & Pwr. Co., of Copperhill, has recently installed a tungsten street-lighting system. M. C. King is president.

DICKSON, TENN.—At an election held March 18 bonds to the amount of $15,000 were authorized, the proceeds to be used for extensions to the electric-lighting system and water-works and installing a sewerage system.

HALLS, TENN.—Preparations are being made by the city of Halls for making improvements to the plant of the Halls Wtr., Lt. & Ice Co., recently taken over by the city. The equipment will include one 100-kva, three-phase, 60-cycle, alternating-current generator and engine, directly connected, switchboard to control above unit, one tub transformer to take care of 75 lamps, poles for 7 miles of transmission line (88 ft. apart), six lightning arresters for above poles and about 5 miles of copper wire for transmission line. Contracts for the above apparatus will probably be awarded in April, and work will begin on the plant about May 1. About 12,000 ft. 4-in. cast-iron pipe and 25 hose plugs (two outlets, 2½ in.) will also be required. Bonds to the amount of $25,000 have recently been issued for municipal plant. William Hall is manager.

KNOXVILLE, TENN.—The Southern Ry. Co., of Washington, D. C., is planning to install an electric block system at Knoxville and will require special transformers in connection with the system. It is proposed to light the switches. The company, it is stated, will build a power station at Morristown, Tenn.

MEMPHIS, TENN.—Application has been made to the city commissioners by the Memphis Automatic Tel. Co. for a 30-year franchise to operate a telephone system in Memphis. The company proposes to purchase the property of the Memphis Tel. Co. and reorganize under the name of the Memphis Automatic Tel. Co., with an authorized capital stock of $2,000,000; also to expend $500,000 in telephone extensions. Among the incorporators are C. W. Thompson, J. B. Goodbar, T. R. Winfield, L. W. Johnson, George G. Alban and others.

NASHVILLE, TENN.—A permit has been taken out by the Nashville Ry. & Lt. Co. for the erection of a concrete smokestack, 150 ft. high, with an inside diameter of 12 ft., to replace two steel stacks, 200 ft. high and 12 ft. in diameter.

SHELBYVILLE, TENN.—Within the next six months the Duck River Pwr. Co. of Shelbyville expects to erect a single-phase transmission line to Manchester, a distance of 16 miles; also to purchase one 40-kw, 10,000-volt transformer in addition to line material. A. F. Trimble is general manager.

ONEONTA, ALA.—The Oneonta Ice, Lt. & Coal Co. is installing an electric plant in Oneonta. The equipment will consist of an 80-hp high-pressure boiler, engine, one 50-kva General Electric generator and switchboard, Western Electric transformers, wire, 400 red-cedar poles, 100 Western Electric meters and 1000 incandescent lamps. Contract for the work has already been awarded. R. E. Richie, of the Birmingham El. Co., is engineer in charge of the work. B. B. Hale is president of the company.

ALEXANDRIA, LA.—The Alexandria El. St. Ry. Co., it is reported, contemplates the construction of a power plant at the mill of the Bayou Rapids Rubber Co.

BATON ROUGE, LA.—The Baton Rouge El. Co. is contemplating extensive improvements to its plant; also the removal of the power house to some point on the river front accessible to the railroads.

CHECOTAH, OKLA.—Within the next two months the Checotah Wtr., Lt. & Ice Co. expects to purchase fixtures for installing about 50 6.6-amp street lamps (from 100 watts to 250 watts). The company will also purchase from time to time general supplies as demands may require. L. B. Griffing is secretary and manager.

HOLDENVILLE, OKLA.—The Holdenville Ice & El. Co. has one 90-kw and one 75-kw Westinghouse generator (single-phase, 60-cycle, 1100/2200 volts), which it would like to exchange for one three-phase generator (about 75 kw, 60 cycles, 2300 or 2200 volts). W. M. Dunn is president and manager.

PAULS VALLEY, OKLA.—The Washita El. Pwr. Co. of Paul's Valley, expects to purchase within the next three months one 100-kw generator and engine. The company would like to purchase second-hand equipment. R. S. Johnston is secretary.

DALLAS, TEX.—Extensions and improvements will be made to the property of the Continental Gin Co., of Dallas, involving an expenditure of about $300,000. The work will include equipment of power house, constructing dry kilns, building forge shop, installing electrical and heating equipment, sheds for air drying, etc.

DALLAS, TEX.—The commissioners of Dallas County, it is reported, have awarded the contract for the construction of an electric light and power plant for the new county jail and criminal court buildings to Kinnison Brothers, of Dallas, at $34,533. The equipment will include two 200-hp boilers, two generators and engines.

HOYT, TEX.—The Consumers' Lignite Co., of Dallas, it is reported, is installing an electric-light plant at its coal mines. Hoyt has not a post office.

HUBBARD, TEX.—The Union Central Lt. & Ice Co., of Hubbard, is asking for bids for 10,000 ft. to 20,000 ft. No. 14 weather-proof copper wire. W. A. Bass is president and manager.

LONGVIEW, TEX.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 12, for the construction, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Longview. Drawings and specifications may be obtained from the above office or from the custodian of site at Longview. O. Wenderoth is supervising architect.

SEGUIN, TEX.—Plans have been announced by the Guadalupe Wtr. Pwr. Co. for the construction of a large hydroelectric power system on the Guadalupe River, between Seguin and New Braunfels. The company proposes to build five dams between the two towns, which it is estimated will develop a total of 100,000 hp. In addition, there will be constructed in the upper portion of the river, above New Braunfels, a large reservoir with a capacity of 150,000 acre-ft. of water, which will conserve the flood waters and regulate the flow of water at the power dams. The cost of the entire project is estimated at $8,000,000. The greater part of the energy generated will be transmitted to San Antonio; other towns within a radius of 60 miles will also be supplied. Water will also be furnished from the power and storage dams for irrigating land in the valley of the Gaudalupe River. The company has already expended about $450,000 on preliminary work. The officers are: Dr. E. W. Brown, of Orange, Tex., president; W. B. Dunlap, of Beaumont, vice-president, and G. M. Abbott, secretary.

SHERMAN, TEX.—Bonds to the amount of $5,000 have been voted for street lighting.

SNYDER, TEX.—The City Council has awarded a contract to the Snyder Ice & Lt. Co. to install 20 street lamps of 80 cp.

TERRELL, TEX.—The power plant of the Terrell El. Lt. Co. was recently destroyed by fire, causing a loss of about $30,000. M. A. Joy is president of the company.

WEATHERFORD, TEX. — The power house of the Weatherford Wtr., Lt. & Pwr. Co. was destroyed by fire on March 16, causing a loss of about $25,000. The city will be without elcetrical service until a temporary installation is made.

Pacific States

NEWPORT, WASH. — The Pomona Grange, operating in Stevens County, has decided to construct approximately 100 miles of telephone lines throughout the county. For further information address Fred F. Johnston, Spring Valley, Wash.

SEATTLE, WASH.—The Board of Public Works, it is reported, is receiving bids for furnishing the Municipal Light Department with approximately 10,000 integrating, induction-type, 60-cycle, alternating-current electric wattmeters. H. W. Carroll is clerk.

SUNNYSIDE, WASH.—The Pacific Pwr. & Lt. Co., of Sunnyside, has recently completed 7½ miles of 6600-volt, three-phase transmission line into the farming districts to furnish electrical service to the farmers. V. V. Vercoe is local manager.

ALBANY, ORE.—A committee has been appointed by the Commercial Club to make investigations as to the feasibility of establishing a municipal electric plant here and cost of same and report to the club as soon as possible. For further information address A. M. Hammer, care of the Commercial Club.

AUMSVILLE, ORE.—At a special election to be held May 23 the proposal to grant a franchise to the Aumsville Flour Mills to install and operate an electric-light plant in Aumsville will be submitted to the voters.

KENO, ORE.—Plans are being considered by the Keno Pwr. Co., recently incorporated with a capital stock of $250,000, for doubling the output of its power plant and extending its transmission lines to Klamath Falls. J. W. Kearns, of Keno, is interested in the company.

MOLALLA, ORE.—The City Council is considering four applications for franchises to furnish electricity for lamps and motors in Molalla. Two applications (one by Fred Schafe, of Molalla, and the other by M. J. Lee, of Canby) have passed their first reading. The party which secures the franchise will develop water-power sites on the Molalla River, near the city.

REEDSPORT, ORE.—A permit has been granted to James Lindsay, of Portland, by the Department of Agriculture, for the construction of a hydroelectric power plant on Mill Creek within the boundaries of Siuslaw National Forest. Energy generated at the plant will be transmitted to Reedsport, a distance of 18 miles. The equipment will include three 1150-hp horizontal turbines (Francis type), operating under a head of 263 ft., directly connected to three 750-kw, three-phase, alternating-current generators.

ANTIOCH, CAL.—The Great Western Pwr. Co., of San Francisco, has applied to the State Railroad Commission for a certificate of public convenience and necessity which will authorize the company to exercise franchise rights in Antioch. The company has been granted a franchise by the trustees of Antioch to erect a tie line from its substation just outside of Antioch to the plant of the Bowers Rubber Co., near Pittsburg.

BUENA PARK, CAL.—The Chamber of Commerce has passed a resolution authorizing ornamental lamps erected on Grand Avenue to be maintained by underground conduits. Plans are being considered for installing ornamental lamps, at intervals of 300 ft., along the highway from Northam to the county road on the south, a distance of 4 miles.

CALISTOGA, CAL.—Bids will be received at the office of the county clerk of the county of Napa, Court House, Napa, until April 15 for a 50-year franchise to erect and operate electric transmission lines over and under the roads and highways in Napa County, as applied for by the Calistoga El. Co., of Calistoga.

FRESNO, CAL.—Plans for the electrolier street-lighting system in the business section of the city, to cost from $60,000 to $75,000, have been adopted by the Merchants' Association. The plans provide for 487 standards for five-lamp clusters.

GRASS VALLEY, CAL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 6 for construction complete, including mechanical equipment, interior lighting fixtures and approaches to the United States post office at Grass Valley. Drawings and specifications may be obtained at the above office or from the custodian of site at Grass Valley. O. Wenderoth is supervising architect.

LAGUNA BEACH, CAL.—At an election to be held April 18 the proposal to install an electric street-lighting system in Laguna Beach will be submitted to the voters. It is estimated that 129 lamps will be required.

LOS ANGELES, CAL.—The Pacific El. Ry. Co., of Los Angeles, is contemplating equipping the Salt Lake line between Pasadena and Los Angeles for electrical operation.

PLACERVILLE, CAL.—The Truckee River General El. Co., of Reno, Nev., it is reported, will soon begin work on construction of several reservoirs and ditches and two power plants on Pilot Creek, to be known as plants No. 1 and No. 2.

SAN FRANCISCO, CAL.—Electrically operated cranes and carriers are to be installed on Piers 30 and 32 by the American-Hawaiian Steamship Co. in the near future.

SAN FRANCISCO, CAL.—Business men and property owners on Mission Street have agreed to expend $15,000 for the installation of ornamental arches on that street between Sixteenth Street and Twenty-fourth Street.

STRATHMORE, CAL.—The Mount Whitney Pwr. Co., of Visalia, is planning to erect a substation with an output of 1000 kw in Strathmore. The equipment will consist of two 500-kw transformers and four secondary circuits. The building will be of fireproof construction with out-door switches. Orders have been placed for transformers.

VENTURA, CAL.—The Ventura County Pwr. Co. has applied to the State Railroad Commission for authority to issue $200,000 in notes, the proceeds to be used to refund outstanding obligations aggregating $120,850, and the remainder for the erection of a transmission line and construction of a hydroelectric generating plant.

POCATELLO, IDAHO.—The City Council has passed an ordinance creating an ornamental lighting district (as an extension to the present cluster-lamp system) to cost about $15,000.

GLASGOW, MONT.—The City Council is contemplating the installation of a new street-lighting system, to cost approximately $21,398. E. E. Crawford is city clerk.

RED LODGE, MONT.—The Northwestern Improvement Co., of Red Lodge, expects to purchase some meters, wire and lamps (on a small scale). The company operates an electric plant in connection with its coal mines which furnishes electricity for mine haulage, pumping and for lighting purposes in Red Lodge. The purchasing is done by F. G. Prest, purchasing agent of Northern Pacific Ry. Co., St. Paul, Minn.

WELLS, NEV.—Plans are being considered by Frank Jeanny to install an electric-light plant in Wells.

RATON, N. M.—Within the next six months the Raton El. Lt. & Pwr. Co. may purchase meters for its system. J. R. Smith is manager.

Canada

KASLO, B. C.—The by-law authorizing the purchase of the plant of the Kootenay El. Co., of Kaslo, to be owned and operated by the municipality, has been approved by the ratepayers.

HALIFAX, N. S.—A bill has been introduced in the Legislature to incorporate the Nova Scotia Tramway & Pwr. Co., Ltd., to be capitalized at $5,000,000 with power to increase it to $10,000,000; also an authorized bond issue of $9,000,000. The bill authorizes the new company to purchase the property of the Halifax Tramway Co. The Nova Scotia Lt. & Pwr. Co. agrees to transfer to the new corporations its rights to certain power sites and lands. The directors of the new company are largely the same as those of the Halifax Tramway Co.

BRANTFORD, ONT.—The Board of Water Commissioners has entered into a contract with the Hydro-Electric Power Commission of Ontario for 400 hp to operate the new pumps.

BRANTFORD, ONT.—The ratepayers have voted in favor of the purchase by the city of the Brantford Street Railway and the Grand Valley Railway, operating an electric railway from Brantford to Galt, for $253,000.

PARRY SOUND, ONT.—The town of Parry Sound has been granted permission by the Legislature to purchase the dams and other works of the Parry Sound River Improvement Co. on the Seguin River and to use the same to generate electricity for the town. The company blocked the waters with its dam to such an extent that the municipal electric-light plant has been rendered useless on different occasions.

WOODBRIDGE, ONT.—A by-law authorizing the municipality to enter into a contract with the Hydro-Electric Power Commission of Ontario for hydroelectric power will be submitted to the ratepayers on April 11. If the by-law carries, debentures to the amount of $6,000 will be sold to provide funds for installation of a distributing system.

SWIFT CURRENT, SASK.—The town of Swift Current, it is reported, has decided to issue $15,000 in debentures for the purchase of a site for an electric light and power plant and water-works.

Miscellaneous

PANAMA.—Bids will be received at the office of the assistant purchasing agent, Isthmian Canal Commission, 24 State Street, New York, N. Y., until April 14 for the purchase of electrical material, including transformers, motors, engines, locomotives, generators, controllers, exciter set, etc., offered for sale by the Isthmian Canal Commission. Blanks and general information may be obtained from the above office. Major F. C. Boggs is general purchasing officer. For further information see proposal columns.

PANAMA.—Bids will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until April 18 for furnishing chain sets, track spikes, cable clips, magnesia pipe covering, wire nails, cable chisels, machine bolts, steel plates, steel bars, detonators, motors, transfer cars for dry kiln, and piling trucks, steel angles, steel squares, etc., as per circular (No. 837). For further information address Major F. C. Boggs, general purchasing officer.

New Incorporations

THORSBY, ALA.—The Thorsby Lt. & Wtr. Pwr. Co. has been incorporated by A. K. Horn and others. The company is capitalized at $2,000 and proposes to construct and operate an electric-light plant in Thorsby.

HELENA, ARK.—The West Helena Consol. Co. has been incorporated with a capital stock of $650,000 to construct electric railway lines. The officers of the company are E. C. Horner, of Helena, president; R. B. Macon, vice-president, and John C. Horner, secretary.

DOVER, DEL.—The Southern Ry. & Lt. Co. has filed articles of incorporation with a capital stock of $500,000, under the laws of the State of Delaware, to generate and distribute electricity for lamps, heaters and motors. The incorporators are H. E. Latter, N. P. Coffin and O. J. Reichard, of Wilmington.

FORT GAINES, GA.—The Credille-Fowler Pwr. & Mfg. Co. has been incorporated with a capital stock of $25,000 by W. T. Credille, M. L. Fowler, Hamilton McRae and M. M. Smith. The company proposes to construct an electric plant. J. N. Ely, of Atlanta, Ga., is consulting engineer.

PALESTINE, ILL.—The La Motta Co-operative Tel. Co. has been incorporated with a capital stock of $250,000 by G. L. Weener, M. Fife and E. S. Dry.

BARLOW, KY.—The Barlow Lt. & Pwr. Co. has been chartered with a capital stock of $2,000. The incorporators are J. W. Meshew, W. R. Crice and T. R. Johnson.

LEWISBURG, KY.—The J. E. Powell El. Lt. Co. has been incorporated with a capital stock of $1,500 by J. E. Powell, E. Hunt and W. T. Watkins.

GOOD THUNDER, MINN.—The Good Thunder El. Co. has been formed with a capital stock of $10,000 for the purpose of furnishing electricity in Good Thunder. It is understood that a steam-driven plant will be installed. The officers are: Dr. T. J. Schlesselman, president; E. W. O'Neill, vice-president; F. H. Groffin, secretary, and F. H. Morelock, treasurer.

KANSAS CITY, MO.—The Funsten El. Co. has been incorporated with a capital stock of $10,000 by Robert L. and Fitzhugh L. Funsten and John C. Donnell.

RED LODGE, MONT.—The Carbon & Stillwater El. Ry. Co. has been incorporated with a capital stock of $750,000 to build an interurban electric railway between Red Lodge and Columbus, a distance of 40 miles.

CAMDEN, N. J.—The Beach Haven El. Lt., Ht. & Pwr. Co. has been incorporated with a capital stock of $100,000 by Frederick R. Bagwell, G. R. Holmes, of Baltimore, Md., and S. R. Leap, of Penns Grove, Pa. The company proposes to operate light, heat and power plants.

RANDOLPH, N. Y.—The Randolph Lt. & Pwr. Co. has been incorporated with a capital stock of $20,000 to supply electricity in Randolph. The incorporators are Albert J. Woodsworth, G. D. Woodsworth and Joseph W. Randolph, all of Randolph.

ASHEVILLE, N. C.—The White Coal Pwr. Co. has been incorporated with a capital stock of $125,000 by Daniel W. Adams and others. The company proposes to construct and operate an electric railway in Old Fort and the surrounding country and to develop water and other power for commercial purposes.

CINCINNATI, OHIO.—The Diamond Lt. Co. has been granted a charter with capital stock of $30,000 to supply electricity for lighting. The incorporators are C. B. Arnold, George Dresselhouse, R. K. Hynicka, J. M. Wikel and E. W. Risley.

CLEVELAND, OHIO.—The West Ninth Street El. Co. has been chartered with a capital stock of $10,000 for the purpose of generating and distributing electricity. The incorporators are M. Greenhut, Ella Greenhut, R. Greenhut, Max P. Goodman and A. L. Dietz.

MINERAL CITY, OHIO.—The Industrial Pwr. & Lt. Co. has been incorporated with a capital stock of $200,000 by J. I. Davy, S. L. Martin, Frank Graham, W. G. Limbaugh and Frances Ferguson. The company proposes to generate and distribute electricity.

ARDMORE, OKLA.—The Ardmore El. Ry. Co. has been incorporated by George A. Craven, James C. Mort, John F. Easley, of Ardmore; Asa B. Hale and William Craven, of Milton, Ia. The company is capitalized at $100,000 and proposes to build an electric railway in Ardmore and its suburbs, covering about 7 miles. The charter of the company also gives it the right to sell electricity for lamps and motors. The cost of the system is estimated at $150,000.

QUINTON, OKLA.—The Quinton Ice, Lt. & Pwr. Co. has been incorporated with a capital stock of $5,000 by James Fogarty, Milo T. Crane and Mary E. Fogarty, of McAlester.

RIDDLETON, TENN.—The Little River Lt. & Pwr. Co. has been incorporated with a capital stock of $10,000 to develop the water-power of Little River and to operate a telephone exchange in Riddleton.

AUSTWELL, TEX.—The Austwell Utilities Co. has been incorporated with a capital stock of $25,000 by P. R. Austin, D. S. Emison and W. H. Dunson.

EMORY, TEX.—The Emory El. Lt. & Pwr. Co. has been chartered with a capital stock of $2,000 by G. W. Alexander and K. L. McCormick.

PITTSBURG, TEX.—The Home Lt. & Ice Co. has been incorporated with a capital stock of $15,000 for the purpose of building an electric plant and ice factory. Phillip Dolinski is president and W. P. Grammeer secretary and treasurer.

Directory of Electrical Associations, Societies, Etc.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala. Semi-annual meeting, Mobile, Ala., May, 1914.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. General meeting, New York, April 16-18.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Annual meeting, Detroit, Mich., June 23-25, 1914.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Secretary, William H. Ross, 154 Nassau St., New York City.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

AMERICAN WATER WORKS ASSOCIATION. Secretary, J. M. Diven, 47 State St., Troy, N. Y. Annual meeting, May.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, W. J. Tharp, Little Rock, Ark. Annual meeting, Little Rock, April 21-23, 1914.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. T. Snyder, McKeesport, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago. Annual meeting, New Orleans, May 19-22.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, J. H. Larmonth, 610 Confederation Life Bldg., Toronto, Can.

COLORADO ELECTRIC CLUB. Secretary, C. F. Oehlmann. Meets every Thursday at Albany Hotel, Denver, Col.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, J. F. Becker, 1170 Broadway, N. Y.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, C. S. Van Dyck, Schenectady, N. Y.

ELECTRIC CLUB OF CHICAGO. Secretary, Fred M. Rosseland, Monadnock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER BOSTON. Secretary, R. S. Hale, 39 Boylston St., Boston.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO. Secretary, M. N. Blumenthal, 179 West Washington St. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall, United Engineering Societies Building, 29 West 39th St., N. Y. Sections in New England, Chicago, Philadelphia and Washington.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

FARADAY ELECTRICAL ASSOCIATION. Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla. Annual meeting, May 13-15, 1914.

HYDROELECTRIC SECTION, N. E. L. A. Secretary, S. A. Sewall, 29 West 39th St., N. Y.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, A. Newburger. 1153 Myrtle Ave., Brooklyn, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W. S. Vivian, Grand Rapids, Mich.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 81 New St., New York.

INTERNAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTRICAL CONGRESS. Secretary-treasurer, Preston S. Millar, 80th St. and East End Ave., New York. Congress, San Francisco, Sept. 13-18, 1915.

INTERNATIONAL ENGINEERING CONGRESS. Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, September, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 6-11, 1915.

IOWA ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary, H. B. Maynard, Waterloo, Ia. Annual meeting, Cedar Rapids, April 23.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia. Annual meeting, Cedar Rapids, April 23.

JOVIAN ORDER. Jupiter (president), W. N. Matthews, St. Louis Mo.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN ELECTRIC ASSOCIATION. Affiliated with N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, Frank J. Duffy, Natchez, Miss. Annual meeting, Meridian, April 27-29.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis. Annual meeting, May 21-23.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Annual convention, Rochester, N. Y., May 26-28.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York. Annual meeting, Philadelphia, June 1-5.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago. Annual meeting, June, 1914.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee. Ralph Sweetland, 141 Milk St., Boston, Mass. Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, J. B. Earle, Waco, Tex.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass. Directors meet first Wednesday of each month.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. E. Bursiel, 149 Tremont St., Boston, Mass. Annual meeting, Narragansett Pier, R. I., Sept. 2-4.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 312 Carondelet St., New Orleans, La. Meet-

ings, second and fourth Tuesday of each month.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 239 W. 39th St., New York.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Affiliated with the National Electrical Credit Association. Secretary, Franz Neilson, 80 Wall St., New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York. Annual meeting, New York, June, 1914.

NORTHWESTERN CEDARMEN'S ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, F. C. Green, 291 East Morrison St., Portland, Ore. Annual meeting, Portland, June 8-9.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, S. C. Pohe, Bloomsburg, Pa.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York. Annual meeting, New York, May 12.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Prof. H. H. Norris, Ithaca, N. Y. Annual meeting, Princeton, N. J., June.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, A. A. Wilbur, Columbus, Ga. Annual meeting, Isle of Palms, Charleston, S. C., Aug. 19-21, 1914.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex. Annual convention, Galveston, Tex., May 20-23.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, A. B. Marsden, Manchester, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, Stephenson Building, Milwaukee, Wis.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED MARCH 24, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,090,841. ELECTRO - PNEUMATIC BRAKE SYSTEM; J. S. Doyle, New York, N. Y. App. filed March 17, 1910. For securing an increased application of air-brake pressure in applying the brakes.

1,090,872. ELECTRICAL CONDUCTOR; P. P. Nungesser, Cleveland, Ohio. App. filed Dec. 5, 1913. Screw fastener for securing flexible conductor to carbon brush.

1,090,877. VIBRATING CIRCUIT-BREAKER; P. M. Rainey, West Hoboken, N. J. App. filed June 17, 1910. Armature in the form of a long broad vane so as to vibrate approximately at its normal rate immediately upon closing the circuit.

1,090,887. BINDING POST FOR ELECTRIC TERMINALS; A. B. Simpson, Jersey City, N. J. App. filed Nov. 29, 1912. Has a pliable U-shaped strip which clamps the wire.

1,090,888. CONNECTOR FOR ELECTRIC WIRES; A. B. Simpson, Jersey City, N. J. App. filed April 3, 1913. Wires clamped between the folds of a folded strip.

1,090,909. PRIMARY BATTERY; E. G. Dodge, Maplewood, N. J. App. filed June 12, 1909. Of the type in which the negative electrode consists of a plate of oxide of copper or other depolarizing agent.

1,090,917. ELECTRIC IGNITION SYSTEM; T. Hubert, Cranford, and C. E. Lockwood, Plainfield, N. J. App. filed Aug. 5, 1909. To prevent sparking at the plugs at the moment of opening the battery circuit.

1,090,924. ELECTRIC COOKING APPARATUS; J. Lawrence, London, Eng. App. filed March 6, 1912. Electric grill.

1,090,926. ELECTROPLATING APPARATUS; G. A. Lutz, Plainfield, N. J. App. filed Dec. 30, 1911. For supporting plurality of pipes or conduits while simultaneously electroplating the same.

1,090,929. LAMP FIXTURE; H. D. McFaddin, East Orange, N. J. App. filed March 31, 1913. Has flexible strap which clamps around bedpost.

1,090,930. ELECTRIC-LAMP SOCKET; R. R. McIlvaine, Wilkinsburg, Pa. App. filed July 16, 1913. Lamps non-removable from socket and switch elements retained in place without employment of screws.

1,090,940. CRUTCH; S. H. Norton, Meadville, Pa. App. filed July 12, 1913. Electric-light attachment applied to the head of the crutch and controlled by switch on handhold.

1,090,983. ELECTRIC LAMP; E. A. Hawthorne, Bridgeport, Conn. App. filed June 25, 1913. Battery casing and cap is rotated to close circuit.

1,090,989. ELECTRIC SIGN; George T. Kelley, Chicago, Ill. App. filed July 30, 1908. Contact springs attached to endless chain close sign-letter circuits locally, thereby eliminating considerable wiring.

1,090,990. ELECTRIC TRANSMISSION OF ENERGY; I. Kitsee, Philadelphia, Pa. App. filed Feb. 20, 1906. True reversals and transmitted from one terminal station to the other terminal station without changing the devices placed at the station; simultaneously telegraphs and telephones over the same line.

1,090,992. GAS OR VAPOR ELECTRIC LAMP; R. Küch, Hanau, Germany. App. filed March 20, 1906. Electrodes of liquid metal proportioned so that each dissipates heat in proportion to the head generated within it.

1,091,003. ELECTRICALLY CONTROLLED ELEVATOR; T. G. Mason, Toronto, Ontario, Canada. App. filed Dec. 10, 1910. Push-button control in which the operator has absolute control.

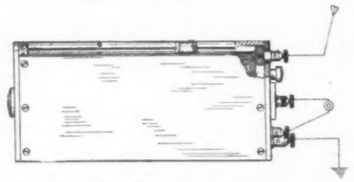
1,091,012. ELECTRICAL SWITCH MECHANISM; R. W. Pachaly, Chicago, Ill. App. filed Feb. 15, 1913. Train ventilators are automatically switched into operation when train slows down or comes to rest.

1,091,014. CIGAR LIGHTER; G. F. Paladani, Waukegan, Ill. App. filed Dec. 9, 1912. Has a torch which is lighted by electric spark when lifted into position for use.

1,091,038. SIGNALING DEVICE; S. Chase, Los Angeles, Cal. App. filed Feb. 3, 1913. Rear signals for autos; front lights near driver's seat indicate which signal has been operated.

1,091,046. COIL FOR ELECTRICAL PURPOSES AND METHOD OF PRODUCING SAME; E. A. DeWolf, Mansfield, Mass. App. filed April 15, 1913. Simultaneously winds insulating material contiguous to the ends of the wire layers.

1,091,102. RAILWAY SIGNALING APPARATUS; B. F. Wooding, Denver, Col. App. filed May 23, 1911. Hangers on locomotive operated by track contacts to give safety or danger signals.



1,091,127—Wireless Receiving Apparatus

1,091,107. **CAR TRUCK; W. S. Adams,** Philadelphia, Pa. App. filed Oct. 23, 1913. Has equalizing bars connecting the axle boxes with springs between said bars and the truck frame.

1,091,127. WIRELESS RECEIVING APPARATUS; R. R. Goldthrop, Hartford, Conn. App. filed Aug. 31, 1912. Wholly self-contained receiver unit.

1,091,133. BLOCK-SIGNAL SYSTEM; L. A. Hawkins, Schenectady, N. Y. App. filed July 5, 1910. Alternating-current system having the distant signal placed at an intermediate point in the block.

1,091,134. NORMAL-DANGER-SIGNAL SYSTEM; L. A. Hawkins, Schenectady, N. Y. App. filed July 23, 1908. Both rails conductively continuous for all currents, alternating-current sources connected at intervals and cross-rails being of same frequency and phase and forming the only cross-connections.

1,091,153. ELECTRIC CLOCK; J. J. Moore, Chambersburg, Pa. App. filed Jan. 10, 1913. A prime mover starts the clock by giving it an initial impulse and thereafter imparts impulses whenever the beat is below the normal length.

1,091,155. ELECTRIC SWITCH; T. E. Murray, New York, N. Y. App. filed Nov. 27, 1912. Closes circuit through a main fuse and thereafter connects a second fuse in parallel with the main fuse.

1,091,180. MERCURY-VAPOR APPARATUS; J. R. Baker, Arlington, N. J. App. filed April 10, 1913. Electrode consisting of mercury and a body of carborundum penetrating the meniscus of the mercury.

1,091,185. ANODE AND ANODE HOOK; H. R. Boissier, Great Neck, N. Y. App. filed May 9, 1913. Provided with co-acting surfaces of the tongue-and-groove variety.

1,091,193. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Jan. 19, 1906. Incoming calls are automatically apportioned among the idle portions of the connective apparatus.

1,091,222. METHOD FOR THE ELECTRICAL PRODUCTION OF LIGHT; P. C. Hewitt, New York, N. Y. App. filed April 11, 1898. Mercury vapor, with means for operating the electrodes alternately as cathodes.

1,091,223. APPARATUS FOR OPERATING VAPOR CONVERTERS; P. C. Hewitt, New York, N. Y. App. filed April 8, 1904. Employs two transformers, one with two secondaries for keeping the vapor converters alive and the other an auto-transformer having a single secondary.

1,091,225. PROTECTION OF FEEDERS OF ELECTRICAL DISTRIBUTION SYSTEMS; P. V. Hunter, Heaton, Eng. App. filed Oct. 7, 1912. Opens switches in the feeder circuit on leakage occurring from the feeder.

1,091,226. ELECTRICAL SOCKET AND RECEPTACLE; L. Kellner, New York, N. Y. App. filed May 13, 1913. Removal of lamp prevented by the screw shell rotating with the lamp.

1,091,242. DIRECTION INDICATOR FOR ELECTROMECHANICAL TELEGRAPH SYSTEMS; W. K. Queen and T. F. Pickett, Needham Heights, Mass. App. filed June 17, 1910. For transmission of visual and audible signals from the pilot house to the engine room and vice versa.

1,091,244. ELECTRODE FOR GAS OR VAPOR ELECTRIC APPARATUS; M. Von Recklinghausen, Paris, France. App. filed Feb. 14, 1903. Has a plurality of positive electrodes and a main negative electrode interposed between at least two of the positive electrodes.

1,091,256. ELECTRICAL DISTRIBUTION SYSTEM; P. H. Thomas, Montclair, N. J. App. filed March 5, 1903. Combines vapor converter with one or more magnets for regulating the current in a portion of a system supplied from a source of variating or pulsating currents.

1,091,389. INTERNAL-COMBUSTION ENGINE; H. L. Reese, Philadelphia, and H. H. Platt, Wallingford, Pa. App. filed Dec. 20, 1912. Has compression and working cylinders with a combustion chamber intermediate to the two.

1,091,420. SYSTEM OF REGULATION FOR DYNAMO-ELECTRIC MACHINES; V. G. Apple, Dayton, Ohio. App. filed April 12, 1912. Maintains constant the current or the potential under varying conditions of load or speed.

1,091,465. SIGNALING SYSTEM; F. B. Adam and L. H. Arens, St. Louis, Mo. App. filed Oct. 22, 1912. Means for causing certain signals to operate automatically at a certain period and others to operate automatically at a different period, etc.

13,704 (reissue). HEAT-DISSIPATING MEANS FOR ELECTRICAL APPARATUS; H. A. Rhodes, Denver, Col. App. filed Jan. 17, 1911. Has layers of sheet-metal foil interposed between the conductors with the extremities of the sheet slit and bent into engagement with the spool for heat-dissipating purposes.